Quality Assurance Project Plan
Lower Passaic River Restoration Project

Low Resolution Coring Supplemental Sampling Program Addendum
Second Supplemental Sampling Program

September 2013, Rev. 1

Prepared for:
Cooperating Parties Group
Newark, New Jersey

Document No.: 60145884.P401

CV012004a

AECOM

Quality Assurance Project Plan

Low Resolution Coring Supplemental Sampling Program Addendum
Second Supplemental Sampling Program
Lower Passaic River Restoration Project
New Jersey

Lower Passaic River Study Area

Low Resolution Coring Supplemental Sampling Program Addendum

Second Supplemental Sampling Program

September 2013

Revision 1

Approved By: Debra L. Simmons
Debra L. Simmons, Project QA Manager

Date: September 20, 2013

Approved By:
Douglas E. Simmons, Task Manager

Date: September 20, 2013

Contents

List of Acronyms

Acronym	Definition
%D	Percent Difference
%R	Percent Recovery
µmoles/g	Micro Moles per Gram
2,3,7,8-TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin
ASTM	ASTM International
AVS/SEM	Acid Volatile Sulfides/Simultaneously Extracted Metals
Be-7	Beryllium-7
BHC	Benzene hexachloride
CA	Corrective Action
ALS	ALS, formerly Columbia Analytical Services
CAS Number	Chemical Abstracts Services Number
CCC	Calibration Check Compounds
CCV	Continuing Calibration Verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFT	Chemical Fate and Transport
CLH	Chemical Land Holdings
COC	Chain of Custody
COPC	Chemical of Potential Concern
CPG	Cooperating Parties Group
CPR	Cardiopulmonary Resuscitation
CRM	Certified Reference Material
Cs-137	Cesium 137
CSM	Conceptual Site Model
Cu/Mn	Copper/Manganese
CVAAS	Cold Vapor Atomic Absorption Spectrometry
CVAFS	Cold Vapor Atomic Fluorescence Spectrometry
CY	Calendar Year
DDD	Dichlordiphenyldichloroethane
DDE	Dichlordiphenyldichloroethylene
Ddms	de Maximus Data Management Solutions
DDT	Dichlordiphenyltrichloroethane
DFTPP	Decafluorotriphenylphosphine
GPS	Differential Global Positioning System
DMP	Data Management Plan
DoD	Department of Defense
DQI	Data Quality Indicators
DQL	Data Quality Level

List of Acronyms (Continued)

DQO	Data Quality Objectives
EDD	Electronic Data Deliverable
EDL	Estimated Detection Limit
EDP	Electronic Data Processor
EHS	Environmental Health and Safety
EMBM	Empirical Mass Balance Model
EML	Estimated Minimum Level
FS	Feasibility Study
FSP	Field Sampling Plan
Ft	Feet
FTM	Field Task Manager
G	Gram
GBA	Gahagan & Bryant Associates, Inc.
GC	Gas Chromatography
GC/FID	Gas Chromatography/Flame Ionization Detector
GC/FPD	Gas Chromatography/Flame Photoionization Detector
GC/MS	Gas Chromatography/Mass Spectrometry
GPC	Gel Permeation Chromatography
H&S	Health and Safety
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HDR	HydroQual, Inc.
HRC	High Resolution Core
HRGC/HRMS	High Resolution Gas Chromatography-High Resolution Mass Spectrometry
HRGC/LRMS	High Resolution Gas Chromatography-Low Resolution Mass Spectrometry
ICAL	Initial Calibration
ICP/AES	Inductively Coupled Plasma-Atomic Emission Spectrometry
ICP/MS	Inductively Coupled Plasma-Mass Spectrometry
ICS A	Interference Check Sample
ICV	Initial Calibration Verification
IDL	Instrument Detection Limit
IEC	Interelement Correction
K & L Gates	Kirkpatrick and Lockhart Preston Gates Ellis LLP
LCS	Laboratory Control Sample
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicate
LDC	Laboratory Data Conslutants, Inc.
LIMS	Laboratory Information Management System
LLP	Limited Liability Partnership

List of Acronyms (Continued)

LPR	Lower Passaic River
LPR/NB	Lower Passaic River/Newark Bay
LPRRP	Lower Passaic River Restoration Project
LPRSA	Lower Passaic River Study Area
LRC	Low Resolution Coring
MB	Method Blank
MDL	Method Detection Limit
MEDD	Multi-Media Electronic Data Deliverable
mg/kg	Milligrams per Kilogram
MLW	Mean Low Water
MPI	Malcolm Pirnie, Inc
MS	Matrix Spike
MSD	Matrix Spike Duplicate
N/A	Not Applicable
NA	Not Available
ND	Not Determined
ng/L	Nanograms per Liter
NGVD	National Geodetic Vertical Datum
NIST	National Institute of Standards and Technology
NJDEP	New Jersey Department of Environmental Protection
NOAA	National Oceanic and Atmospheric Administration
NYSDEC	New York State Department of Environmental Conservation
OPR	On-going Precision and Recovery
OSHA	Occupational Safety and Health Administration
OSI	Ocean Surveys Inc.
OU	Operable Unit
Oz	Ounce
PA	Partnering Agencies
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PCDD	Polychlorinated Dibenzodioxins
PCDF	Polychlorinated Dibenzofurans
PE	Performance Evaluation
PFK	Perfluorokerosene
PID	Photoionization Detector
PM	Project Manager
PQO	Project Quality Objectives
PREmis	Passaic River Estuary Management Information System

List of Acronyms (Continued)

PRG	Preliminary Remediation Goals
PRSA	Passaic River Study Area
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QC	Quality Control
QL	Quantitation Limit
QMP	Quality Management Plan
RCL	Recovery Control Limits
RF	Response Factor
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RL	Reporting Limit
RM	River Mile
ROD	Record of Decision
RPD	Relative Percent Difference
RPM	Remedial Project Manager
RRF	Relative Response Factor
RSD	Relative Standard Deviation
RTC	Resource Technology Corporation
S/N	Signal to Noise
SDG	Sample Delivery Group
SDS	Soxhlet/Dean Stark
SIM	Selective Ion Monitoring
SOP	Standard Operating Procedure
SOW	Statement of Work
SPCC	System Performance Check Compounds
SRM	Standard Reference Material
SSO	Site Safety Officer
SSP	Supplemental Sampling Program
SVOC	Semivolatile Organic Compounds
SWO	Stormwater Outfall
TAL	Target Analyte List
TBD	To Be Determined
TC	Technical Committee
TEL	Threshold Effects Level
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon

List of Acronyms (Continued)

TPH	Total Petroleum Hydrocarbons
TRV	Toxicity Reference Value
TSA	Technical Surveillance Audit
UFP	Uniform Federal Policy
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UV-VIS	Ultraviolet -Visible Spectroscopy
WP	Work Plan

Introduction

This document is an addendum to the *Low Resolution Coring Supplemental Sampling Program Qualtiy Assurance Project Plan, Lower Passaic River Study Area,* Revision 3, dated June 25, 2012 (LRC SSP QAPP, AECOM 2012). This addendum updates the SSP QAPP to incorporate the sampling and analytical procedures for the LRC Second Supplemental Sampling Program (SSP2); specific changes include the scope of work for SSP2, annual updates to the laboratory quality assurance and quality control (QA/QC) limits, and annual updates to the laboratoryies' and AECOM's standard operating procedures (SOPs). Table 1 provides a key to the SSP QAPP and the changes incorporated for SSP2. This document describes implementation of the SSP2 sampling, analysis, and associated QA and QC activities for collecting low resolution sediment cores to supplement existing sediment data being used to parameterize the sediment transport and chemical fate and transport (CFT) models and to complete the chemical nature and extent characterization in the Lower Passaic River Study Area (LPRSA).

This document adopts United States Environmental Protection Agency (USEPA) applicable Uniform Federal Policy (UFP) QAPP Worksheets [Publication Numbers: USEPA: EPA-505-B-04-900A; Department of Defense (DoD): DTIC ADA 427785] (USEPA 2005) and SOPs for the field activities. The USEPA has previously approved the Lower Passaic River Restoration Project (LPRRP) Remedial Investigation (RI) Low Resolution Coring/Sediment Sampling QAPP (ENSR 2008) and the River Mile (RM) 10.9 Characterization QAPP (AECOM 2011b). QAPP Worksheets and SOPs developed for previous QAPPs were used for development of this QAPP as they were reviewed and previously approved by USEPA.

This document includes the following components: the QAPP, field SOPs (Appendix A), laboratory SOPs (Appendix B), results of the probing survey conducted in June 2013 (Appendix C), and the evaluation of the program performance evaluation (PE) sample analyses that were performed prior to the start of LRC SSP2 (Appendix D).

Background Information

The LPRSA encompasses the 17.4-mile tidal reach of the Passaic River below the Dundee Dam, its tributaries, and the surrounding watershed that drains to the river below the Dundee Dam. The LPRSA is an operable unit of the Diamond Alkali Superfund Site. A Remedial Investigation/Feasibility Study (RI/FS), originally begun by the USEPA, is currently underway for the LPRSA in accordance with:

- The Lower Passaic River Restoration Project Work Plan (Work Plan) (Malcolm Pirnie, Inc. [MPI] 2005a);
- The Lower Passaic River Restoration Project Field Sampling Plan Volume 1 (FSP1) (MPI 2006a);
- The Lower Passaic River Restoration Project Draft Field Sampling Plan Volume 2 (FSP2) (MPI et al. 2006b);
- The Lower Passaic River Restoration Project Revised Preliminary Draft Field Sampling Plan Volume 3 (FSP3) (MPI 2005b); and
- The Lower Passaic River Restoration Project Quality Assurance Project Plan (QAPP) (MPI 2005c).

In May 2007, USEPA entered into an agreement with the Cooperating Parties Group (CPG), which comprises the companies identified as Potentially Responsible Parties (PRPs). The Administrative Settlement Agreement and Order on Consent [Settlement Agreement]; (USEPA 2007a) requires the Settling

Introduction (continued)

Parties to complete a comprehensive study of contamination and possible remedial approaches for the LPRSA under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (USEPA 1980). The RI/FS is being conducted under the Settlement Agreement and includes the scopes of work identified in FSP1 (MPI 2006a), FSP2 (MPI et al. 2006b), and FSP3 (MPI 2005b).

This CERCLA RI/FS is one component of the overall LPRRP. The LPRRP is a joint CERCLA and Water Resources Development Act project. Several other federal and state agencies are participating in the project, which include the United States Army Corps of Engineers (USACE), New Jersey Department of Transportation (NJDOT), National Oceanic and Atmospheric Administration (NOAA), United States Fish and Wildlife Service (USFWS), and New Jersey Department of Environmental Protection (NJDEP), collectively referred to as the "Partner Agencies."

The LRC program was developed to determine the nature and extent of contamination, including identification of potential source areas, and to characterize physical characteristics of the sediment of the 17.4-mile LPRSA. The LRC field program was conducted from July 30 through December 16, 2008. A draft LRC Characterization Summary report was submitted by the CPG to USEPA on February 26, 2010 and resubmitted by the CPG to USEPA on July 26, 2011 (AECOM, 2011a).

The LRC Supplemental Sampling Program (SSP) was developed to fill specific data gaps identified to support parameterization of the sediment transport and CFT models and to characterize potential human health risk exposure areas. The passage of Hurricane Irene on August 27-28, 2011 also provided a unique opportunity for the LRC SSP to characterize the potential effects of a large storm event on the LPRSA. The LRC SSP was conducted from January 9 through February 10, 2012. The draft LRC SSP Characterization Summary report is in preparation and will be submitted to USEPA during the fourth quarter of 2013.

Data Quality Objectives

The LRC SSP2 was designed to meet two data quality objectives (DQOs):

1. Provide additional characterization of the nature and extent of sediment chemistry and fill data needs above RM 8, as identified by USEPA
2. Provide data to support system understanding, sediment surface concentration mapping, and sediment transport and CFT model parameterization.

Following evaluation of the existing sediment data (LRC, LRC SSP, Benthic [Windward, 2011], and USEPA Empirical Mass Balance Model [EMBM] data), USEPA identified data needs above RM 8 where additional sediment data are needed to complete the chemical nature and extent characterization for the RI and to support evaluation of remedial options. The additional data will provide information on the surficial extent of chemicals of potential concern (COPCs) as well as estimates of COPC inventory.

The ongoing work to develop and calibrate the CFT model led to identification of additional data needs as well. Specifically, additional data will support the interpolation and mapping of measured surface and subsurface sediment concentrations to a continuous surface for initialization of the model grid. Locations were selected to reduce the uncertainty associated with the interpolation observed in the initial mapping results.

Introduction (continued)

The LRC SSP2 locations were selected to achieve the above DQOs, and were refined based on results of a sediment probing survey performed June 3-6, 2013 (Appendix C). The probing survey was designed to characterize the presence or absence of sediment in areas initially identified for sampling in the LRC SSP2 program. Sampling locations were selected where the probing survey indicated the presence of sediment.

Proposed Program

Analytes

The LRC SSP2 includes only low resolution cores and grab samples. High-resolution cores collected during the LRC SSP for Lead-210 analysis will not be collected as part of LRC SSP2. The proposed analyte list for the LRC SSP2 for the low resolution core and grab sample locations is identical to the LRC SSP analyte list (AECOM 2012). .

Sampling Depth

The existing sediment data provide a general understanding of sediment COPC concentrations and distributions at depth in the sediment bed. To support the chemical nature and extent characterization data needs include sampling the sediment bed over the full depth to the native material that underlays the sediment or refusal. To support the mapping and model parameterization data needs are limited to the sediment surface and upper sediment bed, however cores advanced to meet this DQO will be advanced to full depth to the native material or refusal as well. The data collection program includes: (1) 66 coring locations (Figure 1) which will be sampled using the following low resolution sampling intervals: 0 to 0.5 foot surface interval (from the core and grab sample), one to two 1-foot segments (0.5 to 1.5 and 1.5 to 2.5 feet) depending on depth to native material or refusal, and a final one foot sample collected from the one foot above native material or refusal and (2) 8 surface grab locations (Figure 1) which will be sampled for the 0 to 0.5 foot surface interval. Samples from the coring locations will also be collected in one foot intervals and archived. These samples will be collected from the 2.5 foot interval to the top of the one foot sample interval above native material or refusal.

No more than three coring attempts will be advanced at any proposed coring location. If refusal is met in these three attempts; a surface grab sample will be collected if possible. No more than three attempts will be made to collect a grab sample. In the event that the sample volume for any sample segment is minimal the priority analyte list will be employed[1]. Additional coring attempts and surface grab sample events beyond 3 to increase sample volume for a vertical segment will not be conducted

Sampling and Analysis Approach

The field sampling approach includes the following elements:

Sediment Sampling Locations: The proposed sediment sampling locations are presented in Figure 1. Sampling locations were chosen to address the data needs identified above. A summary of the siting rationale for each proposed location is presented in QAPP Worksheet #18. Details of station positioning are provided in SOP LPR-G-02 – Navigation/Positioning (Appendix A).

[1] PCDDs/PCDFs, PCB Congeners & Homologs, Total and Methyl Mercury, Organochlorine Pesticides, Metals, PAHs, and SVOCs (including phthalates).

Introduction (continued)

In order to address the data needs identified above, 74 locations (66 coring locations and 8 surface grab locations) were selected for analysis of physical and chemical analytes. The coring locations will yield a maximum of 4 samples per location and will produce a maximum of 264 samples, not including archived samples. The surface grab locations will yield 1 sample per location and will produce a maximum of 8 samples. Combined the core and surface grab locations will yield a maximum of 272 samples. Where cores are collected, two to three cores will be collected at each location to provide sufficient sample volume for the analyses. One to two surface grab samples will be collected at all locations to provide sufficient sample volume for the analyses.

Sampling Tasks: The sediment characterization program includes the combination of both sediment grabs and core samples. A sediment grab sample will be collected at each station using a modified Van Veen grab or stainless steel power grab with pneumatic ram. The grab sampling effort will yield a surface sediment sample from 0 to 0.5 foot below the sediment-water interface. The sediment grab sample will provide sufficient sediment volume for analysis of specific target analytes (e.g., sulfides, nutrients and acid volatile sulfides/simultaneously extracted metals [AVS/SEM]), as well as additional volume, if needed beyond that collected by the vibracores, to meet the analytical chemistry requirements for the 0 to 0.5 foot sample depth. The sediment grab sample will also provide sufficient sediment volume for analysis for the complete analyte list at core locations where a core can not be advanced (see discussion in Low Resolution Cores section below).

A vibracore system (or piston push core) will be used to collect two to three cores at each coring location for chemical and physical analysis. The cores will be used for analyses for the suite of physical and chemical analytes.

Samples will be processed and transferred to sample containers at the CPG field facility located at the Kelways Industrial Park in East Rutherford, New Jersey (at RM 13.4).

An additional sediment probing survey will be performed at the mouth of Third River, where probing was not conducted during the June 3-6, 2013 probing survey. Probing will be conducted following the same procedures as followed during the June survey (Appendix C). The objective of this limited additional probing survey is to characterize the presence or absence of sediment in area of Third River. Sampling locations in this area may be modified based on this survey and following concurrence from USEPA.

Low Resolution Cores

One set of cores from all 66 core locations (Figure 1) will be sampled using the following low resolution sampling intervals. Samples from the core locations will be collected from the following sampling intervals: 0 to 0.5 foot surface interval (from the core and grab sample), one to two 1-foot segments (0.5 to 1.5 and 1.5 to 2.5 feet) depending on depth to native material or refusal, and a and a final one foot sample collected from the one foot above native material or refusal. Samples from the coring locations will also be collected in one foot intervals and archived. These samples will be collected from the bottom of the 2.5 foot interval to the top of the one foot sample interval above native material or refusal.

No more than three coring attempts will be advanced at any proposed coring location. If refusal is met in these three attempts; a surface grab sample will be collected if possible. No more than three attempts will be made to collect a grab sample. In the event that the sample volume for any sample segment is minimal

Introduction (continued)

the priority analyte list will be employed. Additional coring attempts and surface grab sample events beyond 3 to increase sample volume for a vertical segment will not be conducted

Under certain conditions, the segmentation scheme may be altered to adjust the sampling intervals. For example, where a stratigraphic change in the sediment sequence (e.g., change in sediment size, obvious depositional boundary or unconformity) occurs within a segment, the sampling of that segment may be altered. This will prevent different material types, with possibly different depositional ages, from being mixed together in the same sample. Segments will be reduced to less than 1-foot only where it appears that the sediment density is such that sufficient solids are present to satisfy the laboratory sample volume requirement. These adjustments, if made, will not eliminate the collection of a sample interval.

Surface Grab Samples

In addition to the 66 low resolution core locations, surface grab samples will be collected from 8 locations (Figure 1). Surface grab samples will be collected from the 0 to 0.5 foot surface interval. No more than three attempts will be made to collect a grab sample. In the event that the sample volume for the surface interval is minimal the priority analyte list will be employed. Additional grab sample events beyond 3 to increase volume for a vertical segment will not be conducted.

A comprehensive list of physical, inorganic and organic chemical analyses is proposed for the set of 74 locations. This list includes Polychlorinated Dibenzodioxins (PCDDs)/Polychlorinated Dibenzofurans (PCDFs), PCB congeners and homologs, Polycyclic Aromatic Hydrocarbons (PAHs), Semivolatile Organic Compounds (SVOCs), organochlorine pesticides, butyltins, metals, mercury, Total Petroleum Hydrocarbons (TPH)-Extractables, cyanide, Total Organic Carbon (TOC), grain size, percent moisture, and specific gravity. Sulfide, nutrients (ammonia-nitrogen, phosphorus, and Total Kjeldahl Nitrogen [TKN]) and AVS/SEM will be collected from surficial samples (grabs) only.

Field measurements will include salinity measurement of pore water from grab samples and calculation of bulk density. Physical and chemical tests will be performed on the sediment samples at fixed laboratories according to methods listed in Worksheet #23.

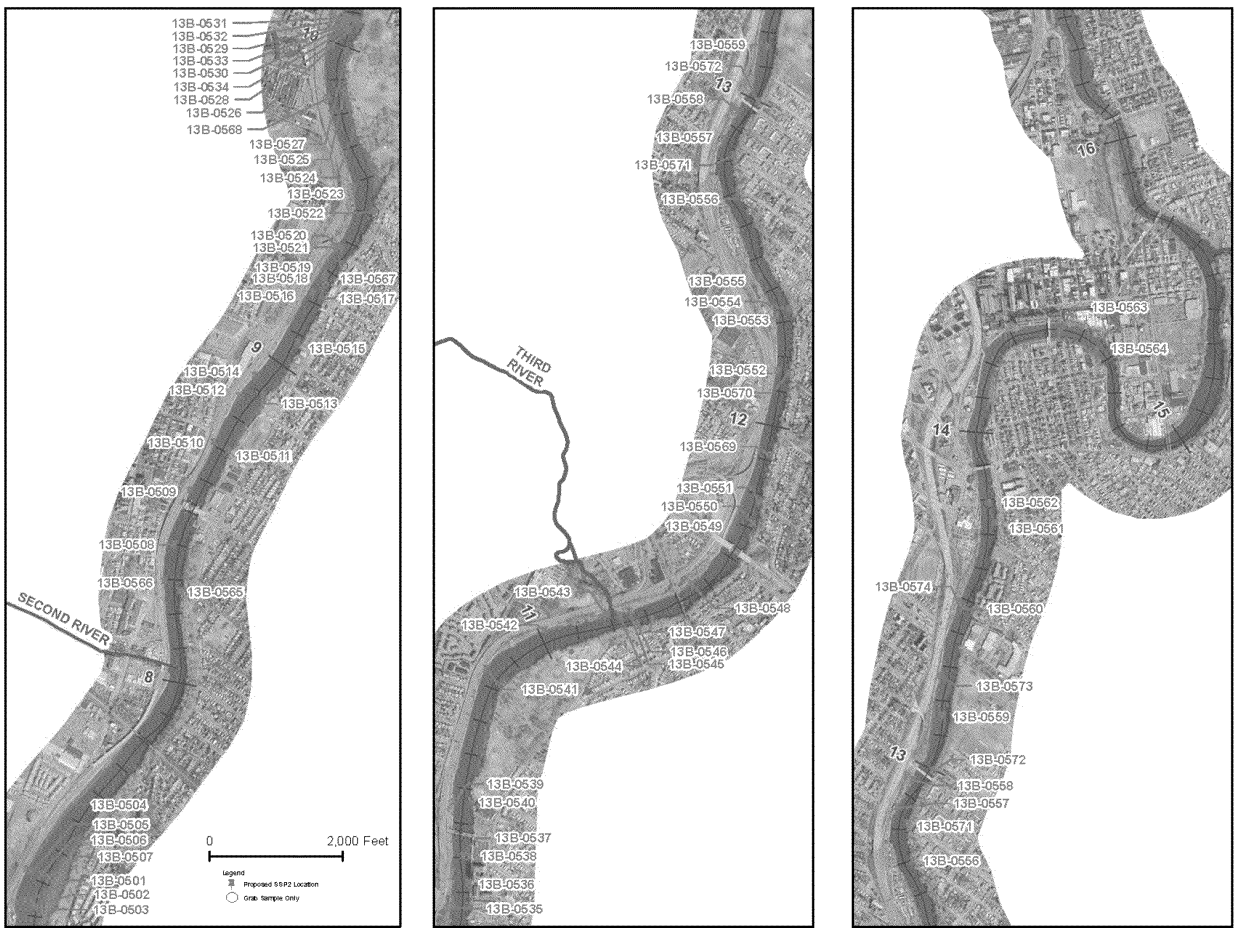


Figure 1 Proposed SSP2 Sampling Locations

Table 1. QAPP Worksheet Key

Worksheet No.	Worksheet Title	SSP2 QAPP Worksheets		
		No Changes	Changes	Comments
1	Title and Approval Page		X	Updated to reflect SSP2
2	QAPP Identifying Information		X	Updated to reflect SSP2 scoping sessions an
3	Distribution List		X	Updated to reflect current projec
4	Project Personnel Sign-Off Sheet		X	Updated to reflect current projec
5	Project Organizational Chart		X	Updated to reflect current projec
6	Communication Pathways		X	Updated to reflect current projec
7	Personnel Responsibilities and Qualifications Table		X	Updated to reflect current projec
8	Special Personnel Training Requirements Table		X	Updated to reflect current projec
9	Project Scoping Session Participants Sheet		X	Updated to add SSP2 Scoping S
10	Problem Definition		X	Updated for SSP2 Statement of Wo
11	Project Quality Objectives/Systematic Planning Process Statements		X	Updated for SSP2 SOW
12	Measurement Performance Criteria Table		X	Updated to remove lead-21
13	Secondary Data Criteria and Limitations Table		X	Updated to included 2012 multibeam and single be field program
14	Summary of Project Tasks		X	Updated for SSP2 SOW
15	Reference Limits and Evaluation Table		X	Updated to remove lead-210, to update achievable correct acquired laboratories n
16	Project Schedule/Timeline Table		X	Updated for SSP2 SOW
17	Sampling Design and Rationale		X	Updated for SSP2 SOW
18	Sampling Locations and Methods/SOP Requirements Table		X	Updated for SSP2 SOW
19	Analytical SOP Requirements Table		X	Updated to remove lead-21
20	Field Quality Control Sample Summary Table		X	Updated for SSP2 SOW and to remo
21	Project Sampling SOP Reference Table	X		
22	Field Equipment	X		
23	Analytical SOP Reference Table		X	Updated to remove lead-210, to reference curren revision date, and/or number), and to correct acqu
24	Analytical Instrument Calibration Table		X	Updated to remove lead-210 and to update to refe SOPs (revision version)
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table		X	Updated to remove lead-21
26	Sample Handling System		X	Edited to clarify that samples will be shipped t
27	Sample Custody Requirements		X	Updated sample event refere
28	QC Samples Table		X	Updated to remove lead-210, to include the SSP2 n and SSP2 number of PE samples, and to correct ac

Introduction (continued)

29	Project Documents and Records Table	X		
30	Analytical Services Table		X	Updated to remove lead-210, and to correct acqu
31	Planned Project Assessment Table		X	Updated to reflect current AECOM health and
32	Assessment Findings and Response Actions		X	Updated to reflect approach for pre-perform
33	QA Management Reports Table	X		
34	Sampling and Analysis Verification (Step I) Process Table	X		
35	Sampling and Analysis Validation (Steps IIa and IIb) Process Table		X	Updated to remove lead-210, and to add referen EMPC-J validation qualifie
36	Sampling and Analysis Validation (Steps IIa and IIb) Summary Table		X	Updated to remove lead-21
37	Data Usability Assessment		X	Updated to include reference to third party data va Consultants)

Document Title: Quality Assurance Project Plan, Low Resolution Coring Second Supplemental Sampling Program, Lower Passaic River Restoration Project

Lead Organization: Cooperating Parties Group and de maximis, Inc.

Preparer's Name and Organizational Affiliation: Doug Simmons, AECOM

Preparer's Address and Telephone Number:

250 Apollo Dr., Chelmsford, MA 01824
978-905-2401

Preparation Date (Day/Month/Year): Revision 0, September 2013, Revision 1, September 2013

Investigative Organization's Project Manager

Laura Kelmar / AECOM / September 2013

Investigative Organization's Project Quality Assurance (QA) Manager

Debra Simmons / AECOM / September 2013

Lead Organization's Project Manager

Bill Potter / Robert Law / de maximis, inc. / September 2013

Site Name/Project Name: **Diamond Alkali Operable Unit (OU 2) – LPRRP RI/FS**

Site Location: **Lower Passaic River Study Area (LPRSA), New Jersey**
Site Number/Code: **CERCLA Document No. 02-2007-2009**
Operable Unit: **OU 2**
Contractor Name: **AECOM**
Contractor Number: **Not Applicable (N/A)**
Contract Title: **N/A**
Work Assignment Number: **N/A**

1. Identify guidance used to prepare QAPP:

   Uniform Federal Policy for Quality Assurance Project Plans. Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs. Part 1: UFP-QAPP Manual. Final Version 1. March 2005. Intergovernmental Data Quality Task Force (US Environmental Protection Agency, US Department of Defense, US Department of Energy). USEPA 505-B-04-900A.

2. Identify regulatory program: Comprehensive Environmental Response Compensation, and Liability Act (CERCLA)

3. Identify approval entity: USEPA Region 2

4. Indicate whether the QAPP is a generic or a project-specific QAPP (circle one)

5. List dates of scoping sessions that were held: December 14 and 18, 2012, April 23, 2013, and May 9, 2013.

6. List dates and titles of QAPP and FSP documents written for previous site work, if applicable:

Title
CLH 1995. *Work Plan, Vol. 1 of Passaic River Study Area Remedial Investigation Work Plans*. Chemical Land Holdings (now Tierra Solutions, Inc.), Newark, NJ. January 1995.
Tierra Solutions, Inc. 1999. *Passaic River Study Area Ecological Sampling Plan. Quality Assurance Project Plan.* March 1999.
MPI 2005a. *Lower Passaic River Restoration Project. Work Plan*. Prepared for US Environmental Protection Agency and US Army Corps of Engineers. Malcolm Pirnie, Inc., White Plains, NY.
MPI 2005b. *Lower Passaic River Restoration Project. Revised preliminary Draft Field Sampling Plan*. Volume 3. Prepared for US Environmental Protection Agency and US Army Corps of Engineers. Malcolm Pirnie, Inc., White Plains, NY
MPI 2005c. *Lower Passaic River Restoration Project. Quality Assurance Project Plan*. Prepared for US Environmental Protection Agency and US Army Corps of Engineers. MPI, White Plains, NY.
MPI 2006a. *Lower Passaic River Restoration Project. Field Sampling Plan*. Volume 1. Prepared for US Environmental Protection Agency, US Army Corps of Engineers. MPI, White Plains, NY.
MPI et al. 2006b. *Lower Passaic River Restoration Project. Field Sampling Plan*. Volume 2. Prepared for US Environmental Protection Agency, US Army Corps of Engineers. Malcolm Pirnie, Inc., White Plains, NY.
MPI 2007c. *QAPP/FSP Addendum for Lower Passaic River Restoration Project Empirical Mass Balance Evaluation*. December 2007.
ENSR 2008. *Lower Passaic River Restoration Project RI/FS. Quality Assurance Project Plan. RI Low Resolution Coring/Sediment Sampling*. Revision 4. ENSR, Westford, MA. October 2008.
AECOM 2008. *Lower Passaic River Restoration Project. Bathymetric Surveys. Quality Assurance Project Plan*. AECOM, Westford, MA. October 2008.

QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information

Windward 2009a. *Lower Passaic River Restoration Project. Lower Passaic River Study Area RI/FS. Quality Assurance Project Plan: Fish and Decapod Crustacean Tissue Collection for Chemical Analysis and Fish Community Survey*. Final. Prepared for Cooperating Parties Group, Newark, New Jersey. Windward Environmental LLC, Seattle, WA. August 2009.
Windward 2009b. *Lower Passaic River Restoration Project. Lower Passaic River Study Area RI/FS. Quality Assurance Project Plan: Surface Sediment Chemical Analyses and Benthic Invertebrate Toxicity and Bioaccumulation Testing*. Final. Prepared for Cooperating Parties Group, Newark, New Jersey. October 8, 2009. Windward Environmental LLC, Seattle, WA. October 2009.
AECOM 2010b. *Quality Assurance Project Plan/Field Sampling Plan Addendum. Remedial Investigation Water Column Monitoring/Physical Data Collection for the Lower Passaic River, Newark Bay and Wet Weather Monitoring. Lower Passaic River Restoration Project.* Revision 4. AECOM, Westford, MA. March 2010.
Tierra Solutions, Inc. 2010. *Combined Sewer Overflow/Stormwater Outfall Investigation Quality Assurance Project Plan. Lower Passaic River Study Area*. Revision 0. July 2010.
AECOM 2011b. *Quality Assurance Project Plan. Lower Passaic River Study Area. River Mile 10.9 Characterization*. Revision 3. AECOM, Chelmsford, MA. October 2011.
AECOM 2012. *Quality Assurance Project Plan. Lower Passaic River Study Area Low Resolution Coring Supplemental Sampling Program*. Revision 3. AECOM, Chelmsford, MA. June 2012

7. List organizational partners (stakeholders) and connection with lead organization:

   This work will be performed under the requirements of the Settlement Agreement and SOW with oversight conducted by USEPA and its government partners, de maximis, Inc. (acting as Project Coordinator for the CPG), AECOM, and its subcontractors, are conducting the work on behalf of the CPG.

8. List data users: See item #7 above.

9. If any required QAPP elements and required information are not applicable to the project, then circle the omitted QAPP elements and required information on the attached table.
   Provide an explanation for their exclusion below: N/A ____

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to QAPP Worksheet No. or Related Documents
Project Management and Objectives		
2.1 Title and Approval Page	- Title and Approval Page	1

QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information

2.2 Document Format and Table of Contents 2.2.1 Document Control Format 2.2.2 Document Control Numbering System 2.2.3 Table of Contents 2.2.4 QAPP Identifying Information	- Table of Contents - QAPP Identifying Information	2
2.3 Distribution List and Project Personnel Sign-Off Sheet 2.3.1 Distribution List 2.3.2 Project Personnel Sign-Off Sheet	- Distribution List - Project Personnel Sign-Off Sheet	3 4
2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements and Certification	- Project Organizational Chart - Communication Pathways - Personnel Responsibilities and Qualifications Table - Special Personnel Training Requirements Table	5 6 7 8
2.5 Project Planning/Problem Definition 2.5.1 Project Planning (Scoping) 2.5.2 Problem Definition, Site History, and Background	- Project Planning Session Documentation (including Data Needs tables) - Project Scoping Session Participants Sheet - Problem Definition, Site History, and Background - Site Maps	9 9 10 and Introduction Figure 1
2.6 Project Quality Objectives (PQOs) and Measurement Performance Criteria 2.6.1 Development of PQOs Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria	- Site-Specific PQOs - Measurement Performance Criteria Table	11 12
2.7 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations Table	13
2.8 Project Overview and Schedule 2.8.1 Project Overview 2.8.2 Project Schedule	- Summary of Project Tasks - Reference Limits and Evaluation Table - Project Schedule/Timeline Table	14 15 16
Measurement/Data Acquisition		

QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information

3.1 Sampling Tasks 3.1.1 Sampling Process Design and Rationale 3.1.2 Sampling Procedures and Requirements 3.1.2.1 Sampling Collection Procedures 3.1.2.2 Sample Containers, Volume, and Preservation 3.1.2.3 Equipment/Sample Containers Cleaning and Decontamination Procedures 3.1.2.4 Field Equipment Calibration, Maintenance, Testing, and Inspection Procedures 3.1.2.5 Supply Inspection and Acceptance Procedures 3.1.2.6 Field Documentation Procedures	- Sampling Design and Rationale - Sample Location Map - Sampling Locations and Methods/ SOP Requirements Table - Analytical Methods/SOP Requirements Table - Field QC Sample Summary Table - Sampling SOPs - Project Sampling SOP References Table - Field Equipment Calibration, Maintenance, Testing, and Inspection Table	17 Figure 1 18 19 20 Appendix A 21 22
3.2 Analytical Tasks 3.2.1 Analytical SOPs 3.2.2 Analytical Instrument Calibration Procedures 3.2.3 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures 3.2.4 Analytical Supply Inspection and Acceptance Procedures	- Analytical SOPs - Analytical SOP References Table - Analytical Instrument Calibration Table - Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	Appendix B 23 24 25
3.3 Sample Collection Documentation, Handling, Tracking, and Custody Procedures 3.3.1 Sample Collection Documentation 3.3.2 Sample Handling and Tracking System 3.3.3 Sample Custody	- Sample Collection Documentation - Handling, Tracking, and Custody SOPs - Sample Container Identification - Sample Handling Flow - Example Chain-of-Custody Form and Seal	26 Appendix A 27 27 Appendix A
3.4 QC Samples 3.4.1 Sampling QC Samples 3.4.2 Analytical QC Samples	- QC Samples Table	28
3.5 Data Management Tasks 3.5.1 Project Documentation and Records 3.5.2 Data Package Deliverables 3.5.3 Data Reporting Formats 3.5.4 Data Handling and Management 3.5.5 Data Tracking and Control	- Project Documents and Records Table - Analytical Services Table - Data Management Procedures	29 30 Data Management Plan (DMP) (AECOM 2010a)
Assessment/Oversight		

QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information

The following persons will receive a copy of the approved Final QAPP, subsequent QAPP revisions, addenda, and amendments:

QAPP Recipients	Title	Organization	Telephone Number	E-mail Address	Document Control Number*
Stephanie Vaughn	Remedial Project Manager (RPM)	USEPA Region 2	212.637.3467	Vaughn.Stephanie@epa.gov	
William Sy	Project QA Officer	USEPA Region 2	732 321-6648	sy.william@epa.gov	
Lisa Baron	Project Manager (PM)	USACE-NY District	917.790.8306	Lisa.A.Baron@usace.army.mil	
Jay Nickerson	Project Coordinator	NJDEP	609.633.1448	Jay.Nickerson@dep.state.nj.us	
Tim Kubiak	Assistant Supervisor of Environmental Contaminants	USFWS	609.646.9310 (ext. 26)	tim_kubiak@fws.gov	
Reyhan Mehran	Coastal Resource Coordinator	NOAA	212.637.3257	reyhan.mehran@noaa.gov	
Robert Law Bill Potter (alternate)	CPG Project Coordinator	de maximis, Inc.	908.735.9315	rlaw@demaximis.com otto@demaximis.com	
William Hyatt	Coordinating Counsel	Kirkpatrick and Lockhart Preston Gates Ellis LLP (K&L Gates)	973.848.4045	william.hyatt@klgates.com	
Mike Barbara	CPG Consultant	mab consulting	937.543.5608	Mab.consulting@verizon.net	
Polly Newbold	CPG QA Coordinator	de maximis Data Management Solutions, Inc. (ddms)	908.479.1975	pnewbold@ddmsinc.com	
Laura Kelmar	AECOM PM	AECOM	978.905.2266	Laura.Kelmar@aecom.com	
Rich Renzi	AECOM Health and Safety Director	AECOM	781.224.6450	Rich.Renzi@aecom.com	
Doug Simmons	LRC SSP2 Task Manager	AECOM	978.905.2401	Doug.Simmons@aecom.com	
Helen Jones	Field Team Manager (FTM)	AECOM	607.342.7302	Helen.Jones@aecom.com	
Helen Jones	Site Safety Officer (SSO)	AECOM	607.342.7302	Helen.Jones@aecom.com	
Debra Simmons	Project QA Manager	AECOM	978.905.2399	Debbie.Simmons@aecom.com	
Mary Kozik Robert Kennedy (alternate)	Project Chemist	AECOM	978.905.2277 978.905.2269	MaryO'ConnellKozik@aecom.com Robert.Kennedy@aecom.com	
James Herberich	Data Management Task Manager	AECOM	978.905.2243	Jim.Herberich@aecom.com	
Lisa Krowitz	Data Validation Coordinator	AECOM	978.905.2278	Lisa.Krowitz@aecom.com	
Betsy Ruffle	Human Health Risk Assessment Task Leader	AECOM	978.905.2377	Betsy.Ruffle@aecom.com	

QAPP Worksheet #3 (UFP-QAPP Manual Section 2.3.1) Distribution List

Rafael Canizares	Modeling Team Task Leader and Liaison	Moffatt & Nichol	212.768.7454	rcanizares@moffattnichol.com	
Mike Johns	Ecological Risk Assessment Task Leader	Windward Environmental	206.378.1364	MikeJ@windwardenv.com	
Ken Cadmus	Vessel Subcontractor Lead	Ocean Survey, Inc. (OSI)	860.388.4631	kac@oceansurveys.com	
Jeff Rakowski George Molnar	USEPA Oversight Contractor	CDM Smith	732.675.0159 908.420.8208	connellypc@cdmsmith.com MolnarGC@cdmsmith.com	

*Uncontrolled electronic copies will be available on www.ourpassaic.org

Organization: A completed sign-off sheet will be maintained in the files for each organization represented below.

*Signature indicates that personnel have read the applicable QAPP sections and will perform the tasks as described.

Project Personnel	Title	Telephone Number	Signature*	Date QAPP Read
Robert Law /Bill Potter (alternate)	CPG Project Coordinator	908.735.9315		
Polly Newbold	CPG QA Coordinator	908.479.1975		
Laura Kelmar	AECOM PM	978.905.2266		
Doug Simmons	AECOM Task Manager	978.905.2401		
Helen Jones	AECOM FTM	607.342.7302		
Helen Jones	AECOM SSO	607.342.7302		
Debra Simmons	AECOM Project QA Manager	978.905.2399		
Mary Kozik	AECOM Project Chemist	978.905.2277		
Robert Kennedy (alternate)	AECOM Project Chemist	978.905.2269		
James Herberich	AECOM Data Management Task Manager	978.905.2243		
Lisa Krowitz	AECOM Data Validation Coordinator	978.905.2278		
Stella Cuenco	LDC Data Validation Lead	760 634-0437		
Ken Cadmus	OSI Vessel Subcontractor Lead	860.388.4631		
See Worksheet #30 for the individual Laboratory PMs	Laboratory PMs	See Worksheet #30 for the Laboratory PMs' Phone Numbers		

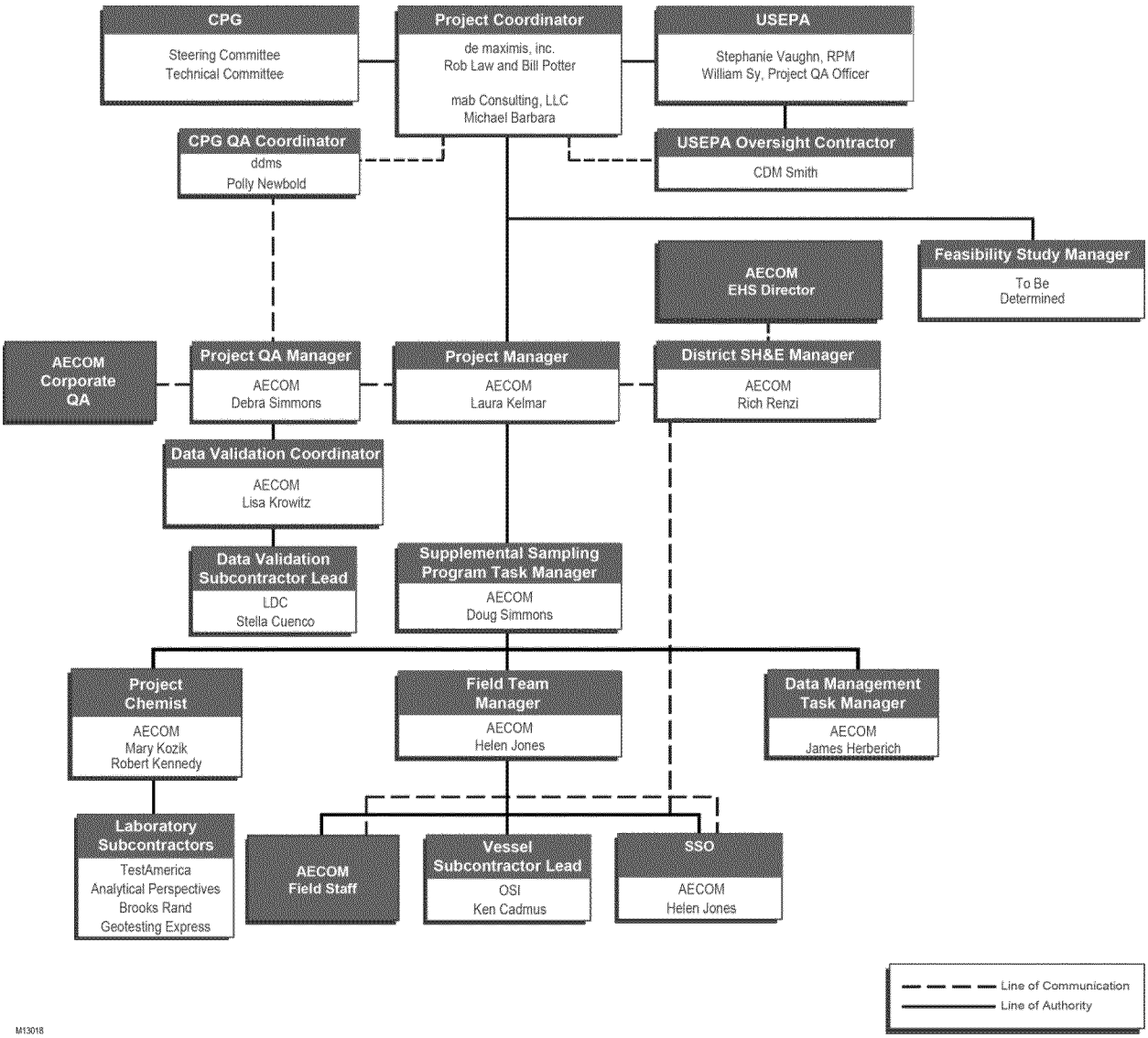
*Signature indicates that personnel have read the applicable QAPP sections and will perform the tasks as described.

QAPP Worksheet #4 (UFP-QAPP Manual Section 2.3.2) Project Personnel Sign-Off Sheet

Organization:

Project Personnel	Title	Telephone Number	Signature*	Date QAPP Read

*Signature indicates that personnel have read the applicable QAPP sections and will perform the tasks as described.



Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (timing, pathways, etc.)
Field activities status and issues	AECOM FTM	Helen Jones	607.342.7302	Communicate daily, or as needed, with AECOM field personnel, subcontractors, and AECOM Task Manager directly, or via e-mail or phone. Minor work plan deviations and/or proposed revisions will be documented and communicated in writing, with a copy sent to USEPA.
Sampling progress/laboratory coordination	AECOM Task Manager	Doug Simmons	978.905.2401 Cell 978.273.4649	Communicate daily, or as needed, with AECOM FTM and Project Chemist via e-mail or phone.
Health and safety briefings and updates	AECOM SSO	Helen Jones	607.342.7302	Communicate daily, or as needed, with field personnel and boat operators directly, or via e-mail or phone.
Significant health and safety concerns or incidents	AECOM SSO	Helen Jones	607.342.7302	Communicate immediately with AECOM Regional EHS Manager, AECOM Task Manager, and AECOM PM.
Sampling vessel operations	Sampling Vessel Captain	To be determined OSI	860.388.4631	Communicate daily, or as needed, with AECOM FTM directly. The sampling vessel captain has the ultimate authority for stopping work while working on water. The vessel captain, in consultation with the SSO, will follow guidelines documented in the site-specific Health and Safety Plan (HASP). In addition, standard safe boating practices related to weather conditions and vessel operations will apply, even if not specifically addressed in the HASP.
Analytical laboratory issues, including coordination with field, schedule, and technical issues	AECOM Project Chemist	Mary Kozik Robert Kennedy (alternate)	978.905. 2277 978.905.2269	Communicate with AECOM FTM and Laboratory PM as needed via phone or e-mail.
Analytical data validation issues	AECOM Data Validation Coordinator	Lisa Krowitz	978.905.2278	Communicate with Laboratory PM as needed via phone or e-mail.
Audit findings (field and/or laboratory)	AECOM Project QA Manager	Debra Simmons	978.905.2399	Communicate findings to AECOM Task Manager or Laboratory PM (as appropriate); transmit final audit reports, including corrective actions (CA), to AECOM PM, AECOM Task Manager, CPG QA Coordinator, USEPA RPM, and USACE PM..
Issues potentially affecting DQOs	AECOM FTM	Helen Jones	607.342.7302	Communicate as needed with AECOM QA Manager and AECOM Task Manager via e-mail or phone.

QAPP Worksheet #6 (UFP-QAPP Manual Section 2.4.2) Communication Pathways

	OSI Vessel Subcontractor Lead	Ken Cadmus	860.388.4631	
	AECOM Project Chemist	Mary Kozik Robert Kennedy (alternate)	978.905. 2277 978.905.2269	
	AECOM Data Validation Coordinator	Lisa Krowitz	978.905.2278	
	AECOM Task Manager	Doug Simmons	978.905.2401 Cell 978.273.4649	Communicate with AECOM QA Manager and AECOM PM as needed, via e-mail or phone. Notification of the CPG Project Coordinator as appropriate. Significant work plan modifications will be reported to USEPA in writing prior to implementation.
Sediment sample collection task implementation, including sampling, analysis, and reporting	AECOM FTM	Helen Jones	607.342.7302	Communicate with AECOM Task Manager as needed, via e-mail or phone.
Project status and issues (internal)	AECOM PM	Laura Kelmar	978.905.2266	Communicate with CPG Project Coordinator daily, or as needed, via e-mail or phone, and submit monthly progress reports.
Project status and issues (external)	CPG Project Coordinator	Robert Law/ Bill Potter (alternate) (de maximis, inc.) Mike Barbara (mab Consulting, LLC)	908.735.9315	Communicate with USEPA RPM as needed via e-mail or phone.

QAPP Worksheet #6 (UFP-QAPP Manual Section 2.4.2) Communication Pathways

	CPG Coordinating Counsel	William Hyatt / Dawn Monsen (K&L Gates)	973.848.4045 or 4148	In the event the CPG Project Coordinator is unavailable for communication with USEPA, the AECOM PM will notify the Coordinating Counsel prior to contacting USEPA.
Quality status and issues	CPG QA Coordinator	Polly Newbold	908.479.1975	Communicate with CPG Project Coordinator as needed via e-mail or telephone
Data management	AECOM FTM	Helen Jones	607.342.7302	Communicate with the Data Management Task Manager via e-mail; transmit final field locations and sample collection information daily.
Data management (con't)	AECOM Data Management Task Leader	Jim Herberich	978.905.2243	Maintain comprehensive project technical database, communicate with AECOM FTM to receive data from the field; communicate with Laboratory PM(s) to receive analytical result data, communicate with AECOM Data Validation Coordinator to facilitate validation review and database update; communicate with AECOM Task Manager to provide data for review; and provide data deliverables to USEPA.
	Laboratory PM	See Worksheet #30	See Worksheet #30	Transmit Electronic Data Deliverables (EDDs) to Data Management Task Manager.
	AECOM Data Validation Coordinator	Lisa Krowitz	978.905.2278	Communicate with Data Management Task Manager regarding final data qualifiers.

QAPP Worksheet #6 (UFP-QAPP Manual Section 2.4.2) Communication Pathways

Stop Work (technical non-compliance)	AECOM Field team, Project QA Manager, Project Chemists, and Data Management Task Manager			Any personnel believing that a work stoppage is necessary shall first verbally notify the AECOM Task Manager or the AECOM PM, who will in turn verbally notify de maximis, inc. and/or AECOM Project QA Manager, if necessary. Given the potential significance of such communications, this will occur as quickly as possible.

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Robert Law	CPG Project Coordinator (Lead)	de maximis, Inc.	Overall responsibility for the safe and proper execution of task. Be available to discuss and review technical and other issues that may arise during work. Periodically review and audit work to ensure that work plan, project quality assurance/quality control (QA/QC), and Health and Safety (H&S) including both boating and hazardous materials worker safety procedures are being followed. All deviations from approved project plans will be discussed with and approved by the CPG Project Coordinator. Primary point of contact with the USEPA, its oversight contractor and the LPRSA Partner Agencies.	PhD, Geology, 30 years experience
Willard Potter	CPG Project Coordinator (Alternate)	de maximis, Inc.	Serves as back up for the Lead CPG Project Coordinator. Responsible for the safe and proper execution of task. Be available to discuss and review technical and other issues that may arise during work. Periodically review and audit work to ensure that work plan, project QA/QC, and H&S including both boating and hazardous materials worker safety procedures are being followed. All deviations from approved project plans will be discussed with and approved by the CPG Project Coordinator. Primary point of contact with the USEPA, its oversight contractor and the LPRSA Partner Agencies.	BS, Chemical Engineering, 40 years experience
Mike Barbara, PE	Principal	mab consulting LLC	Project oversight and coordination with the CPG Coordinator.	ME, Environmental Engineering, BE, Civil Engineering, 37 years experience
Laura Kelmar	AECOM PM	AECOM	Overall responsibility for completion of RI tasks in accordance with SOW requirements including technical, financial, and scheduling. Primary point of contact for AECOM with CPG Project Coordinator.	BS, Chemical Engineering, MS, Environmental Engineering, 20 years experience

QAPP Worksheet #7 (UFP-QAPP Manual Section 2.4.3) Personnel Responsibilities and Qualification Table

Doug Simmons	AECOM Task Manager	AECOM	Responsible for the execution and completion of the LRC SSP, including procurement of subcontractors, review of task deliverables, and serving as the focus for coordination of all field and laboratory tasks. The AECOM Task Manager will keep the AECOM PM apprised of the status of the task; as well as communicate any issues with the schedule, budget, or achievement of the task objectives.	MS, Geology, 37 years experience
Helen Jones	FTM	AECOM	Responsible for implementing field sampling activities in accordance with the approved plans (QAPP, HASP) and pertinent SOPs. Primary responsibilities will include directing activities on site, monitoring subcontractor performance in the field, reviewing field records, and communicating daily with the AECOM Task Manager regarding status, quality issues, or delays.	BS, Chemistry & Mathematics, MS, Geochemistry, 6.5 years experience
Debra Simmons	Project QA Manager	AECOM	Responsible for reviewing and approving QA procedures, ensuring that planned QA assessments (e.g., technical surveillance audits [TSA], data validation) are conducted according to the QAPP and the AECOM Quality Management Plan (QMP) (AECOM 2009) and reporting on the adequacy of the QA Program to the AECOM PM.	BS, Biology, 33 years experience
Rich Renzi	Health and Safety Director	AECOM	Responsible for ensuring that the objectives of AECOM's Health and Safety Program are met and for monitoring task activities for conformance to the HASP.	MS, Public Health, CIH, 35 years experience

QAPP Worksheet #7 (UFP-QAPP Manual Section 2.4.3) Personnel Responsibilities and Qualification Table

Helen Jones	SSO	AECOM	Responsible for monitoring subcontractor/field team performance in the field and communicating daily with the AECOM FTM, AECOM Task Manager or Regional EHS Manager, as appropriate, regarding health and safety, etc. Will ensure that the objectives of the project's Health and Safety Program are met.	BS, Chemistry & Mathematics, MS, Geochemistry, 6.5 years experience
Mary Kozik	Project Chemist (Lead)	AECOM	Responsible for laboratory procurement and monitoring of progress and will be the primary point of contact with the laboratory(ies). The Project Chemist will also be responsible for communicating any issues that could affect achievement of the DQOs to the AECOM LRC SSP Task Manager and the AECOM Project QA Manager.	MS, Chemistry, 37 years experience
Robert Kennedy	Project Chemist (Alternate)	AECOM	Responsible for providing additional technical resources and serves as a back up to the Lead Project Chemist.	BA, Chemistry, 32 years experience
Lisa Krowitz	Data Validation Coordinator	AECOM	Responsible for managing the validation task, including ensuring that validation is conducted and documented according to the requirements of this QAPP, and interacting with the laboratories to resolve any issues.	MS, Environmental Science, 28 years experience
James Herberich	Data Management Task Manager	AECOM	Responsible for data management for project, Including overall responsibility for database quality and structure, including graphical representation of data.	BA, Engineering Sciences, 27 years experience
Polly Newbold	CPG QA Coordinator	ddms, Inc.	Provides oversight of project QA/QC. Periodically review and audit operations to ensure that QAPP QA/QC procedures are being followed.	BS, Textile Science, 31 years experience

QAPP Worksheet #7 (UFP-QAPP Manual Section 2.4.3) Personnel Responsibilities and Qualification Table

Ken Cadmus	Vessel Subcontractor Lead	OSI	Responsible for vessel operation, providing crew and equipment. Acts as the primary point of contact between AECOM FTM and AECOM Task Manager and vessel crew.	MS, Civil Engineering, 16 years experience
John Reynolds	Laboratory PM	TestAmerica	Acts as the primary point of contact at TestAmerica facilities for the AECOM Project Chemist to communicate and resolve sampling, receipt, analysis, and storage issues. Coordinates communication for all TestAmerica network laboratories.	BS, Biology, 21 years experience
Lynda Huckestein	Laboratory PM	ALS, formerly Columbia Analytical Services	Acts as the primary point of contact at ALS facilities for the AECOM Project Chemist to communicate and resolve sampling, receipt, analysis, and storage issues. Coordinates communication for all ALS network laboratories.	BS, Microbiology, 22 years experience
Lydia Greaves	Laboratory PM	Brooks Rand, LLC	Acts as the primary point of contact at Brooks Rand, LLC for the AECOM Project Chemist to communicate and resolve sampling, receipt, analysis, and storage issues.	BS, Chemistry, 6 years experience
Heather Distel	Laboratory PM	SGS - Analytical Perspectives	Acts as the primary point of contact at SGS - Analytical Perspectives for the AECOM Project Chemist to communicate and resolve sampling, receipt, analysis, and storage issues.	PhD , Chemistry, 3 years experience
Gary Torosian	Laboratory PM	GeoTesting Express	Acts as the primary point of contact at GeoTesting Express for the AECOM Project Chemist to communicate and resolve sampling, receipt, analysis, and storage issues.	BS, Civil Engineering, 20 years experience

Project Function	Specialized Training by Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/ Certificates
FTM	40 hour Hazardous Waste Operations and Emergency Response (HAZWOPER)	QES/Churchill Environmental, Inc	October 2006	Helen Jones	FTM /AECOM	AECOM
	HAZWOPER 8-hr Supervisor	Association of Bay Area Governments Training Center	February 2007			
	HAZWOPER 8-hr Refresher	AECOM	within 12 months (mo)			
	First Aid/ Cardiopulmonary Resuscitation (CPR)	AECOM	within 24 mo			
SSO	40 hour HAZWOPER	QES/Churchill Environmental, Inc	October 2006	Helen Jones	SSO/AECOM	AECOM
	HAZWOPER 8-hr Supervisor	Association of Bay Area Governments Training Center	February 2007			
	HAZWOPER 8-hr Refresher	AECOM	within 12 mo			
	First Aid/CPR	AECOM	within 24 mo			

QAPP Worksheet #8 (UFP-QAPP Manual Section 2.4.4) Special Personnel Training Requirements Table

Project Function	Specialized Training by Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/ Certificates
Field Personnel	40 hour HAZWOPER	AECOM	Various	Various	Various/AECOM	AECOM
	HAZWOPER 8-hr Refresher	AECOM	within 12 mo			
	Hazmat awareness	AECOM	Various			
Sampling Vessel Captain	40 hour HAZWOPER	Varies	Various	Various Captains	OSI	OSI
	HAZWOPER 8-hr Refresher	Varies	within 12 mo			
	U.S. Coast Guard license	U.S. Coast Guard	Various			
	First Aid/CPR	Varies	within 24 mo			

Project Name: RI LRC Second SSP Projected Date(s) of Sampling: September 2013 through October 2013 Project Manager: Bill Potter/ Robert Law			Site Name: Diamond Alkali OU 2 - LPRRP RI/FS Site Location: LPRSA	
Date of Session: December 14, 2012 **Scoping Session Purpose: USEPA-CPG Call**				
Name	**Affiliation**	**Phone #**	**E-mail Address**	**Project Role**
S. Vaughn	USEPA	212.637.3467	Vaughn.Stephanie@epa.gov	RPM
R. Law	de maximis	908.735.9315	rlaw@demaximis.com	CPG Project Coordinator
M. Greenblatt	Integral Consulting	781.863.0969	mgreenblatt@integral-corp.com	CPG Technical Consultant
B. Franklin	USACE	212.264.0614	Elizabeth.a.buckrucker@usace.army.mil	PA
E. Garland	HydroQual, Inc.	201.529.5151	Egardland@hydrolqual.com	USEPA Consultant
S. Kirchner	CDM Smith	732.590.4677	kirchnersf@cdmsmith.com	USEPA Oversight Contractor
F. Tsang	CDM Smith	212.377.4056	tsangc@cdmsmith.com	USEPA Oversight Contractor

Comments/Decisions:

USEPA and CPG discussed the list of proposed locations that USEPA provided to the CPG on 11/21/12. This list included approximately 75 locations throughout the LPR with approximately 40 locations below RM 8, within the FFS proposed remediation area. In addition to these proposed samples, USEPA mentioned that NJDEP had requested significantly more locations, although the specific locations were not discussed on this call. The CPG indicated that they did not feel that any additional samples were necessary to complete the RI/FS, and that the collection of additional samples would have schedule implications, as the data would need to be incorporated into the on going modeling and risk assessment evaluations.

The DQOs of some of the proposed sampling locations were discussed. Specifically, additional samples in areas already identified as target areas (e.g., RM 7.3) would not provide additional information for characterization, and the density would not be sufficient for design. Rather, the CPG suggested that additional sampling be focused on areas that will provide information to support the targeted remedy. At other locations (e.g., No Name Creek), CPG suggested that consideration of EMBM sediment data collected by USEPA (not previously considered in the identification of the original set of sample locations), indicated that additional samples were not necessary for characterization. It was agreed that it did not make sense to sample some areas where construction activities were currently ongoing, and that utility crossings posed a limitation to selecting some sample locations.

USEPA and CPG agreed to arrange a second call and web conference to walk through individual locations.

QAPP Worksheet #9 (UFP-QAPP Manual Section 2.5.1) Project Scoping Session Participants Sheet

Project Name: RI LRC Second SSP **Projected Date(s) of Sampling: September 2013 through October 2013** **Project Manager: Bill Potter/ Robert Law**			**Site Name: Diamond Alkali OU 2 - LPRRP RI/FS** **Site Location : LPRSA**	
Date of Session: December 18, 2012 **Scoping Session Purpose: USEPA-CPG Call**				
Name	**Affiliation**	**Phone #**	**E-mail Address**	**Project Role**
S. Vaughn	USEPA	212.637.3467	Vaughn.Stephanie@epa.gov	RPM
R. Law	de maximis	908.735.9315	rlaw@demaximis.com	CPG Project Coordinator
M. Greenblatt	Integral Consulting	781.863.0969	mgreenblatt@integral-corp.com	CPG Technical Consultant
B. Franklin	USACE	212.264.0614	Elizabeth.a.buckrucker@usace.army.mil	PA
E. Garland	HydroQual, Inc.	201.529.5151	Egardland@hydrolqual.com	USEPA Consultant
J. Wands	HDR	201.529.5151	jwands@hydrolqual.com	USEPA Consultant
S. Kirchner	CDM Smith	732.590.4677	kirchnersf@cdmsmith.com	USEPA Oversight Contractor
F. Tsang	CDM Smith	212.377.4056	tsangc@cdmsmith.com	USEPA Oversight Contractor

Comments/Decisions:

The CPG presented to USEPA and USEPA consultants a set of proposed locations (based on the USEPA proposed locations). Locations included those focused on supporting the targeted remedy, and did not include those that had no specific DQOs to support the RI/FS. Proposed locations supported characterization of the lateral extent of contaminated mudflats (as opposed to the longitudinal extent proposed by USEPA). Several locations were discussed and consensus achieved on where they should be placed, and USEPA was in general agreement with the CPG suggestions. At the conclusion of the call, CPG agreed to provide USEPA with a table and set of maps summarizing the proposed locations.

QAPP Worksheet #9 (UFP-QAPP Manual Section 2.5.1) Project Scoping Session Participants Sheet

Project Name: RI LRC Second SSP **Projected Date(s) of Sampling: September 2013 through October 2013** **Project Manager: Bill Potter/ Robert Law**	**Site Name: Diamond Alkali OU 2 - LPRRP RI/FS** **Site Location : LPRSA**
Date of Session: April 23, 2013 **Scoping Session Purpose: USEPA-CPG Update Meeting**	

Name	Affiliation	Phone #	E-mail Address	Project Role
R. Law	de maximis, inc.	908.735.9315	rlaw@demaximis.com	CPG Project Coordinator
W. Potter	de maximis, inc.	908.735.9315	otto@demaximis.com	CPG Project Coordinator
M. Barbara	mab Consulting LLC	908.510.5703	mab.consulting@verizon.net	CPG Technical Consultant
J. Connolly	Anchor QEA	201.930.9890	jconnolly@anchorqea.com	TC Member
M. Greenblatt	Integral Consulting	781.863.0969	mgreenblatt@integral-corp.com	CPG Technical Consultant
R. Basso	USEPA	215-637- 4417	Basso.Ray@epamail.epa.gov	Strategic Integration Manager
S. Vaughn	USEPA	212.637.3467	Vaughn.Stephanie@epa.gov	RPM
R. Mehren	NOAA	212.637.3257	Reyhan.mehran@noaa.gov	PA
A. Hayton	NJDEP	609.984.9772	Anne.hayton@dep.state.nj.us	PA
J. Nickerson	NJDEP	609.633.1448	Jay.nickerson@dep.state.nj.us	PA
L. Baron	USACE	917.790.8306	Lisa.A.Baron@usace.army.mil	PA
S. Kirchner	CDM Smith	732.590.4677	kirchnersf@cdmsmith.com	USEPA Oversight Contractor

Comments/Decisions:

A meeting was convened at USEPA offices to identify where additional sediment data were needed to complete the RI and to develop a path forward to finalize the data collection program. USEPA and the Partnering Agencies (PAs) stated that additional sediment data in the upper 9 mile of the LPRSA was required in order to complete the nature and extent and adequately identify remedial alternatives as part of the LPRSA RI/FS. The CPG stated that they felt there was sufficient data to complete the RI/FS, based on existing data density and the data density at other sites where Record of Decisions (RODs) have been issued.

The CPG presented their understanding of the USEPA's proposed, revised program, and USEPA provided some clarification on DQOs for specific locations. The CPG suggested that, if additional data were to be collected, there were locations not included in the USEPA program that would provide data to support specific elements of the system understanding. The CPG agreed to develop a program that considered both USEPA locations and CPG locations, and provide USEPA and the PAs with detailed information and data supporting the selection of sampling locations.

QAPP Worksheet #9 (UFP-QAPP Manual Section 2.5.1) Project Scoping Session Participants Sheet

Project Name: RI LRC Second SSP **Projected Date(s) of Sampling: September 2013 through October 2013** **Project Manager: Bill Potter/ Robert Law**			**Site Name: Diamond Alkali OU 2 - LPRRP RI/FS** **Site Location : LPRSA**	
Date of Session: May 9, 2013 **Scoping Session Purpose: USEPA-CPG Call**				
Name	**Affiliation**	**Phone #**	**E-mail Address**	**Project Role**
R. Law	de maximis, inc.	908.735.9315	rlaw@demaximis.com	CPG Project Coordinator
B. Potter	de maximis, inc.	908.735.9315	otto@demaximis.com	CPG Project Coordinator
M. Barbara	mab Consulting LLC	908.510.5703	mab.consulting@verizon.net	CPG Technical Consultant
J. Connolly	Anchor QEA	201.930.9890	jconnolly@anchorqea.com	TC Member
M. Greenblatt	Integral Consulting	781.863.0969	mgreenblatt@integral-corp.com	CPG Technical Consultant
R. Basso	USEPA	215-637-4417	Basso.Ray@epamail.epa.gov	Strategic Integration Manager
S. Vaughn	USEPA	212.637.3467	Vaughn.Stephanie@epa.gov	RPM
R. Mehren	NOAA	212.637.3257	Reyhan.mehran@noaa.gov	PA
A. Hayton	NJDEP	609.984.9772	Anne.hayton@dep.state.nj.us	PA
J. Nickerson	NJDEP	609.633.1448	Jay.nickerson@dep.state.nj.us	PA
L. Baron	USACE	917.790.8306	Lisa.A.Baron@usace.army.mil	PA
B. Franklin	USACE	212.264.0614	Elizabeth.a.buckrucker@usace.army.mil	PA
S. Kirchner	CDM Smith	732.590.4677	kirchnersf@cdmsmith.com	USEPA Oversight Contractor
S. Budney	CDM Smith	732.590.4662	budneysl@cdmsmith.com	USEPA Oversight Contractor
F. Tasng	CDM Smith	212.377.4056	tsangc@cdmsmith.com	USEPA Oversight Contractor

Comments/Decisions:

A conference call was convened to review revised LRC SSP2 locations that included both USEPA and CPG locations. CPG presented a set of maps showing existing sediment data, silt area boundaries, probing data, and the proposed SSP2 locations. CPG proposed to perform additional probing to fill in areas where no information on sediment type and volume is available. USEPA agreed that this information would be useful in the selection of SSP2 locations, and would support identification of actionable levels of silt. It was agreed that the locations would be finalized following completion of the probing survey.

QAPP Worksheet #10 (UFP-QAPP Manual Section 2.5.2) Problem Definition

The problem to be addressed by the project:

Following evaluation of the existing sediment data (LRC, LRC SSP, Benthic [Windward, 2011], and USEPA EMBM data), USEPA identified spatial data needs above RM 8 where additional sediment data are needed to complete the chemical nature and extent characterization for the RI and to support evaluation of remedial options. The collection of additional data will provide information on the surficial and vertical extent of COPCs as well as estimates of COPC inventory

The ongoing work to develop and calibrate the CFT model led to identification of additional data needs as well. Specifically, additional data will support the interpolation and mapping of measured surface and subsurface sediment concentrations to a continuous surface for initialization of the model grid. Locations were selected to reduce the uncertainty associated with the interpolation observed in the initial mapping results.

Data Quality Objective 1 (DQO 1): 1. Provide additional characterization of the nature and extent of sediment chemistry and fill data needs above RM 8, as identified by USEPA	
DQO Step	**Description**
STEP 1 **State the problem**	Following evaluation of the existing sediment data (LRC, LRC SSP, Benthic [Windward, 2011], and USEPA EMBM data), USEPA identified spatial data needs above RM 8 where additional sediment data are needed to complete the chemical nature and extent characterization for the RI and to support evaluation of remedial options. The collection of additional data will provide information on the surficial and vertical extent of COPCs as well as estimates of COPC inventory. The existing sediment data provide a general understanding of sediment COPC concentrations and distributions at depth in the sediment bed. To support the chemical nature and extent characterization data needs include sampling the sediment bed over the full depth to the native material that underlays the sediment.
STEP 2 **Identify the goals of the study**	**Principal Study Question** ▪ What are the surficial and vertical extent of sediment COPC concentrations above RM 8 in different reaches or areas of the river that can be used to fill data needs as identified by USEPA to support evaluation of remedial alternatives. **Program Goals** This program will supplement the existing surficial sediment data throughout the LPRSA. Data collection will include analysis of: ▪ TOC ▪ Total sulfide ▪ Percent moisture ▪ Grain size ▪ Specific gravity ▪ Bulk density (determined in field facility) ▪ TAL metals and titanium ▪ SVOCs ▪ PAHs and alkyl PAHs ▪ PCBs (homologs and congeners) ▪ PCDDs/PCDFs ▪ Organochlorine pesticides (not including toxaphene) ▪ TPH extractable ▪ Butyltins

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

	Mercury (low-level) ▪ Cyanide ▪ AVS/SEM ▪ Phosphate (total) ▪ TKN ▪ Ammonia as N ▪ Salinity (determined in the field for pore water) **Alternative Actions** The following alternative actions could result from resolution of the principal study questions: ▪ Sufficient average surficial sediment COPC concentrations and COPC concentrations over the full depth of the sediment bed to native material are available to evaluate potential risk. ▪ Additional average surficial sediment COPC concentrations and COPC concentrations over the full depth of the sediment bed to native material are available to evaluate potential risk. **Decision Statement on Characterization of Sediment COPC** ▪ If supplemental sediment data indicate COPC have not been adequately characterized above RM 8, additional, focused data collection may be warranted to reduce uncertainty in these localized areas to better characterize the average COPC concentrations.
STEP 3 **Identify the information inputs**	Information required to answer the decision statement will include the existing field data and data to be obtained from the planned sampling events (See Step 5 of DQO 1), as summarized below. **New Data Needed** Low resolution coring at 66 locations and surface grab collection at 8 locations will be implemented above RM 8 to obtain physical and chemical data detailed below in Step 5. **Existing Field Data (to be Augmented)** Limited sediment physical characterization and chemical quality data are available from previous studies:

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

	2005 MPI High Resolution Coring data ▪ 2008 CPG LRC data ▪ 2009 CPG Benthic (surface) sediment data ▪ 2012 CPG LRC SSP data **Existing Reports** ▪ MPI, 2007 Conceptual Site Model ▪ MPI, 2006 Draft Geochemical Evaluation (Step 2) ▪ MPI, 2007 Source Control Early Action Focused Feasibility Study ▪ MPI, 2007/2008 Narratives for High Resolution Cores, Low Resolution Cores, Dundee Dam Coring ▪ AECOM, 2011 LRC Characterization Summary ▪ Windward Environmental, LLC & AECOM, 2009. LPRSA Human Health and Ecological Risk Assessment Streamlined 2009 Problem Formulation ▪ Battelle, 2005. Pathways Analysis Report ▪ AECOM, 2013 LRC SSP Characterization Summary, in preparation
STEP 4 **Define the boundaries of the study**	**Geographic Area** The LPRSA includes the 17-mile tidal reach of the LPR from below the Dundee Dam (RM 17.4) to the confluence with Newark Bay (RM 0). The LPRSA also includes the tributaries to this reach (e.g., Saddle River, Second River, and Third River) and the unnamed creek. This LRC SSP2 program will include sampling above RM 8. **Timeframe** Data will be collected over an estimated 2-month period between September 2013 and October 2013. These data will only be incorporated into the first draft of the RI Report to the extent practical; however, the submission date of the Draft RI Report to USEPA will not be extended to allow incorporation of this data into the report. the data will be fully incorporated into the next revision of the RI Report. **Sample Type**

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

	Sampling intervals for COPCs at the 66 core locations will include surface sediment (0 to 0.5 foot grab and core) samples, consecutively deeper 1-foot sediment core segments to 2.5 feet, depending on depth to native material or refusal, and a final one foot sample collected from the one foot above native material or refusal. Sampling intervals for COPCs at the 8 surface grab locations will include surface sediment (0 to 0.5 foot grab) samples. Samples from the coring locations will also be collected in one foot intervals and archived. These samples will be collected from the 2.5 foot interval to the top of the one foot sample interval above native material or refusal.
STEP 5 **Develop the analytical approach**	**Approach for Collecting Sediment Samples** A grab sample will be collected at each station using a grab sampler (per SOP LPR-S-01). The grab sampling effort will collect surface sediment samples, which are defined as the interval from 0 to 0.5 foot below the sediment-water interface. Vibracoring (or piston push core) will be used to collect surface and deeper sediment samples (per SOP LPR-S-04). Sample processing and transfer to sample containers will be performed at the field facility. **Anticipated Analytical Methods for Sediment Samples** The following lists the analytical methods for sediment sampling: ▪ TOC using the Lloyd Kahn Method ▪ Total sulfide using EPA Method 9030 mod. ▪ Percent moisture using ASTM International (ASTM) Method D2974-07A ▪ Grain size using ASTM Method D422 ▪ Specific gravity using ASTM Method D854 ▪ Bulk density (determined in field facility) (refer to Core Processing SOP LPR-S-04) ▪ TAL metals and titanium using EPA Method 6010B/6020A/7471A ▪ SVOCs using EPA Method 8270C ▪ PAHs and alkyl PAHs using a laboratory-specific SOP (refer to Worksheet #23) based on California EPA Air Resources Board Method 429 and NOAA ORCA 130 Method ▪ PCBs (homologs and congeners) using EPA Method 1668A

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

	PCDDs/PCDFs using EPA Method 1613B ▪ Organochlorine pesticides using a laboratory-specific SOP (refer to Worksheet #23) based on USEPA Method 1699 and NYSDEC HRMS-2 ▪ TPH extractable using NJDEP Method OQA-QAM-025-02/08 ▪ Butyltins using a laboratory-specific SOP (refer to Worksheet #23) based on Krone 1988 ▪ Mercury, low-level, using EPA Method 1631 ▪ Cyanide using EPA Method 9010C/9014 ▪ AVS/SEM using EPA Methods 821R91100, 6010C and 7470A ▪ Phosphate (total) using EPA Method 365.2 modified ▪ TKN using ASTM D3590-89-02 ▪ Ammonia as N using EPA 350.1 ▪ Salinity (determined in the field for interstial water) (refer to Grab Sampling SOP LPR-S-01) **Project Quantification Limits** Project quantification limits are included in QAPP Worksheet #15. **Quality Assurance/Quality Control (QA/QC) Program** QA/QC samples will be analyzed with the sediment samples appropriate for each analytical test, such as field duplicates, laboratory duplicates, laboratory control and matrix control spikes (optional), and performance samples. QAPP Worksheets #12 and #28 provide performance criteria of these precision and accuracy measurements. Worksheet #20 provides frequency of field duplicates and blanks. Data verification and validation protocols are detailed in Worksheets #34, #35, #36, and #37. QAPP Worksheet #31 provides auditing details for the program. **Anticipated Data Evaluations** ▪ Correlations of surficial sediment COPC concentrations with other lines of evidence, including recent and historic bathymetry, geomorphology, grain size, and hydrodynamic model predictions.

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

	Spatial comparison of new physical and chemical sediment data with existing data to better characterize patterns. ▪ Compare surficial sediment COPC concentrations to relevant background and reference values, ▪ Compare surficial sediment COPC concentrations to relevant ecological and human health screening benchmarks, and ▪ Evaluate spatial distribution of COPCs in areas of potential exposure. ▪ Evaluate of AVS/SEM and nutrient data in surface sediments to characterize potential effect on ecological risk.
STEP 6 **Specify performance or acceptance criteria**	Uncertainty is always present in the measurement and interpretation of environmental data. In this case, the focus is on collecting and interpreting data to understand the physical and chemical characteristics of the sediment in the LPRSA. In the absence of defined decision tolerance limits, the sampling design should be developed to identify possible sources of error and minimize them, to the extent practical. The most significant type of error that may be encountered includes that associated with sediment sampling. Both random and systematic errors can be introduced during the physical collection of the sample, sample handling, sample analysis, and data handling. Errors introduced through these steps will be controlled by preparing and following SOPs and establishing appropriate controls for data quality. These controls apply to field procedures (e.g., adherence to SOPs, field equipment calibration, and field duplicates), laboratory analytical errors (e.g., calibration standard, internal standard, surrogate recoveries, and collection and analysis of LCS), and data validation. The QAPP worksheets provide further detail on error control procedures, both in the field and in the laboratory. Appendix A (Field SOPs) and Appendix B (Laboratory SOPs) provide supporting details. Sampling design error is the result of the inherent variability of the sampled population over space and time, the sample collection design, and the number of samples available upon which to base the decision. Because it is impossible to sample every inch of the study area, there is always a possibility that some feature of the natural variability is missed. Sampling design error can increase the chance for misrepresenting the natural variability by random error (imprecision) or systematic error (bias). Because the number of samples controls how well the sampled population is characterized, use of the DQO process requires that the variability of data be understood to evaluate the tradeoff between uncertainty (confidence limit) and sampling intensity. This investigation is meant to supplement characterization of the physical and chemical surficial sediment qualities of the LPRSA using a robust data set. This data set has a characteristic natural variability that will be represented by this data set if all other sources of variability are minimized. The induced variability of the data set can be minimized by reducing the errors associated with samples collection handling, analyses, and reporting with the strict adherence to and use of standardized and

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

	documented procedures, as well as the noting of deviations from these procedures. With this minimization of variability, the data set will then be a better representation of the LPR sediments allowing, improved parameterization of numeric and empirical models with the increased data density.
STEP 7 **Develop the detailed plan for obtaining data**	**<u>Sediment Sampling in the Lower Passaic River</u>** The currently proposed sampling program (for COPC analyses) will consist of: ▪ 74 sampling locations ▪ One sampling event (up to 2 months of field work) to minimize temporal variability ▪ At 66 locations, one surface sediment grab sample will be collected using a grab sampler (SOP LPR-S-01) and two or three sediment cores will be collected using a vibracore (where more appropriate for field conditions, a hand-held coring device, such as a piston push corer will be used). The grab will sample the 0 to 0.5 foot interval. Two cores will be segmented to sample the 0-0.5 foot interval, consecutively deeper 1-foot sediment core segments to 2.5 feet, depending on depth to native material or refusal, and a final one foot sample collected from the one foot above native material or refusal. One core will be the primary core and the second core will be used if sufficient sample volume is not obtained from the first core. A third core may be necessary to provide sufficient volume for QA/QC samples. Samples from the coring locations will also be collected in one foot intervals and archived. These samples will be collected from the 2.5 foot interval to the top of the one foot sample interval above native material or refusal. ▪ At 8 locations, one surface sediment grab sample (0 to 0.5 foot grab) will be collected using a grab sampler (SOP LPR-S-01). Samples should have sufficient mass to analyze for the following suite of analytes. In the event that the sample volume for any sample segment is minimal the priority analyte list will be employed. Additional coring attempts or grab sample attempts beyond 3 to increase sample volume for a vertical segment will not be conducted. ▪ TOC ▪ Total sulfide (grab sample) ▪ Percent moisture ▪ Grain size ▪ Specific gravity

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

	Bulk density (determined in the field facility) ▪ TAL metals and titanium ▪ SVOCs ▪ PAHs and alkyl PAHs ▪ PCBs (homologs and congeners) ▪ PCDDs/PCDFs ▪ Organochlorine pesticides (not including toxaphene) ▪ TPH extractable ▪ Butyltins ▪ Mercury (low-level) ▪ Cyanide ▪ AVS/SEM (grab sample) ▪ Phosphate (total) (grab sample) ▪ TKN (grab sample) ▪ Ammonia as N (grab sample) Sample interval segments may vary to accommodate collection of distinctly different layers of sediment, as described in Worksheet #17. At core locations, the surface sediment from the grab sampler will initially be used for sulfides, nutrients, AVS/SEM and then for the other COPCs after the sediment sample mass from the vibracores has been exhausted. At locations where only surface sediment grab samples are being collected, the fuil suite of anlaltyes will be collected from the surface sediment from the grab sampler.

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

Data Quality Objective 2 (DQO 2): Provide data to support system understanding, sediment surface concentration mapping, and sediment transport and CFT model parameterization.	
DQO Step	**Description**
STEP 1 **State the problem**	The ongoing work to develop and calibrate the CFT model led to identification of additional data needs. Specifically, additional data will support the interpolation and mapping of measured surface and subsurface sediment concentrations to a continuous surface for initialization of the model grid. Locations were selected to reduce the uncertainty associated with the interpolation observed in the initial mapping results.
STEP 2 **Identify the goals of the study**	**Principal Study Questions** ▪ What are the patterns of physical characteristics of surficial sediment in the LPRSA? ▪ What are the patterns of surficial sediment COPC concentrations in the LPRSA? ▪ What are the average physical characteristics in different reaches or areas of the river that can be used to initialize and parameterize the sediment transport and CFT model? ▪ What are the average surficial sediment COPC concentrations in different reaches or areas of the river that can be used to initialize and parameterize the CFT model? **Program Goals** This program will supplement the existing surficial sediment data throughout the LPRSA. Analyses will include: ▪ TOC ▪ Total sulfide ▪ Percent moisture ▪ Grain size ▪ Specific gravity ▪ Bulk density (determined in field facility)

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

	TAL metals and titanium ▪ SVOCs ▪ PAHs and alkyl PAHs ▪ PCBs (homologs and congeners) ▪ PCDDs/PCDFs ▪ Organochlorine pesticides (not including toxaphene) ▪ TPH extractable ▪ Butyltins ▪ Mercury (low-level) ▪ Cyanide ▪ AVS/SEM ▪ Phosphate (total) ▪ TKN ▪ Ammonia as N ▪ Salinity (determined in the field for pore water) **Alternative Actions** The following alternative actions could result from resolution of the principal study questions: ▪ Confirm (and/or refine as appropriate) the parameterization of the physical sediment characteristics for the sediment transport model. ▪ Refine the existing, preliminary parameterization of initial sediment COPC concentrations for the CFT model. **Decision Statements on Parameterization of Numerical Models**

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

	If supplemental surficial sediment data indicate more variation in spatial sediment properties than previously observed in locations that may be identified for additional study (e.g., RM 10.9), additional, focused data collection may be warranted to reduce uncertainty in these localized areas for initialization and parameterization of any modeling that may be performed.
STEP 3 **Identify the information inputs**	Information required to answer the decision statement will include the existing field data and data to be obtained from the planned sampling events (See Step 5 of DQO 2), as summarized below. **New Data Needed** Collection of low resolution cores at 66 stations will be implemented above RM 7 to obtain physical and chemical data detailed below in Step 5. Vibracoring and grab sampling will be utilized for collection of the 0 to 0.5 foot segment for all analytes. To support the mapping and model parameterization data needs are limited to the sediment surface and upper sediment bed, however cores advanced to meet this DQO will be advanced to full depth to native material or refusal. One set of cores from all 66 locations (Figure 1) will be sampled using the following low resolution sampling intervals. Samples from the core locations will be collected from the 0 to 0.5 foot surface interval (from the core and grab sample), one to two 1-foot segments (0.5 to 1.5 and 1.5 to 2.5) depending on depth to native material or refusal, and a final one foot sample collected from the one foot above native material or refusal. Samples from the coring locations will also be collected in one foot intervals and archived. These samples will be collected from the 2.5 foot interval to the top of the one foot sample interval above native material or refusal. No more than three coring attempts will be advanced at any proposed coring location if refusal is met in these three attempts; a surface grab sample will collected if possible. No more than three attempts will be made to collect a grab sample. In the event that the sample volume for any sample segment is minimal the priority analyte list will be employed. Additional coring or grab sample attempts beyond 3 to increase volume for a vertical segment will not be conducted. **Existing Field Data (to be Augmented)** Limited sediment physical characterization and chemical quality data are available from previous studies: ▪ 2005 MPI High Resolution Coring data ▪ 2008 CPG LRC data ▪ 2009/10 CPG Benthic (surface) sediment data ▪ 2012 LRC SSP **Existing Reports**

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

	MPI, 2007 Conceptual Site Model ▪ MPI, 2006 Draft Geochemical Evaluation (Step 2) ▪ MPI, 2007 Source Control Early Action Focused Feasibility Study ▪ MPI, 2007/2008 Narratives for High Resolution Cores, Low Resolution Cores, Dundee Dam Coring ▪ AECOM, 2011 LRC Characterization Summary ▪ AECOM, 2013, LRC SSP Characterization Summary, in preparation
STEP 4 **Define the boundaries of the study**	**Geographic Area** The LPRSA includes the 17.4-mile tidal reach of the LPR from below the Dundee Dam (RM 17.4) to the confluence with Newark Bay (RM 0). The LPRSA also includes the tributaries to this reach (e.g., Saddle River, Second River, and Third River) and the unnamed creek. This second supplemental phase of the LRC program will include sampling above RM 7. **Timeframe** Data will be collected over an estimated 2-month period between September 2013 and October 2013. A draft report will be submitted to USEPA in the second quarter of calendar year (CY) 2014. These data will only be incorporated into the first draft of the RI Report to the extent practical; however, the submission date of the Draft RI Report to USEPA will not be extended to allow incorporation of this data into the report. The data will be fully incorporated into the next revision of the RI Report. **Sample Type** Sampling intervals for COPCs will include surface sediment (0 to 0.5 foot grab and core) samples, consecutively deeper 1-foot sediment core segments to 2.5 feet, depending on depth to native material or refusal, and a final composite sample from 2.5 feet to native material or refusal.
STEP 5 **Develop the analytical approach**	**Approach for Collecting Sediment Samples** A grab sample will be collected at each station using a grab sampler (per SOP LPR-S-01). The grab sampling effort will collect surface sediment samples, which are defined as the interval from 0 to 0.5 foot below the sediment-water interface. Vibracoring (or piston push core) will be used to collect both surface and deeper sediment samples (per SOP LPR-S-04). Sample processing and transfer to sample containers will be performed at the field facility.

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

	Anticipated Analytical Methods for Sediment Samples The following lists the analytical methods for sediment sampling: ▪ TOC using the Lloyd Kahn Method ▪ Total sulfide using USEPA Method 9030 mod. ▪ Percent moisture using ASTM Method D2974-07A ▪ Grain size using ASTM Method D422 ▪ Specific gravity using ASTM Method D854 ▪ Bulk density (determined in field facility) (refer to Core Processing SOP LPR-S-04) ▪ TAL metals and titanium using USEPA Methods 6010B/6020A/7471A ▪ SVOCs using USEPA Method 8270C ▪ PAHs and alkyl PAHs using a laboratory-specific SOP (refer to Worksheet #23) based on California EPA Air Resources Board Method 429 and NOAA ORCA 130 Method ▪ PCBs (homologs and congeners) using EPA Method 1668A ▪ PCDDs/PCDFs using USEPA Method 1613B ▪ Organochlorine pesticides using a laboratory-specific SOP (refer to Worksheet #23) based on USEPA Method 1699 and NYSDEC HRMS-2 ▪ TPH extractable using NJDEP Method OQA-QAM-025-02/08 ▪ Butyltins using a laboratory-specific SOP (refer to Worksheet #23) based on Krone 1988 ▪ Mercury, low-level, using EPA Method 1631 ▪ Cyanide using EPA Method 9010C/9014 ▪ AVS/SEM using EPA Methods 821R91100, 6010C and 7470A ▪ Phosphate (total) using EPA Method 365.2 modified

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

	TKN using ASTM D3590-89-02 ▪ Ammonia as N using EPA 350.1 ▪ Salinity (determined in the field for pore water) (refer to Grab Sampling SOP LPR-S-01) **Project Quantification Limits** QLs are included in QAPP Worksheet #15. **Quality Assurance/Quality Control (QA/QC) Program** QA/QC samples will be analyzed with the sediment samples appropriate for each analytical test, such as field duplicates, laboratory duplicates, laboratory control and matrix control spikes (optional), and performance samples. QAPP Worksheets #12 and #28 provide performance criteria of these precision and accuracy measurements. Worksheet #20 provides frequency of field duplicates and equipment rinsate blanks. Data verification and validation protocols are detailed in Worksheets #34, #35, #36, and #37. QAPP Worksheet #31 provides auditing details for the program. **Anticipated Data Evaluations** ▪ Correlations of surficial sediment COPC concentrations with other lines of evidence, including recent and historic bathymetry, geomorphology, grain size, and hydrodynamic model predictions. ▪ Spatial comparison of new physical and chemical sediment data with existing data to better characterize patterns. ▪ Calculation of average physical and chemical values for initialization and parameterization of the sediment transport and CFT model.
STEP 6 **Specify performance or acceptance criteria**	Uncertainty is always present in the measurement and interpretation of environmental data. In this case, the focus is on collecting and interpreting data to understand the physical and chemical characteristics of the sediment in the LPRSA. In the absence of defined decision tolerance limits, the sampling design should be developed to identify possible sources of error and minimize them, to the extent practical. The most significant type of error that may be encountered includes that associated with sediment sampling and program design. Both random and systematic errors can be introduced during the physical collection of the sample, sample handling, sample analysis, and data handling. Errors introduced through these steps will be controlled by preparing and following SOPs and establishing appropriate controls for data quality. These controls apply to field procedures (e.g., adherence to SOPs, field equipment calibration, and collection and analysis of field duplicates), laboratory analytical errors (e.g., calibration standard, internal standard, surrogate recoveries,

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

	and LCS), and data validation. The QAPP worksheets provide further detail on error control procedures, both in the field and in the laboratory. Appendix A (Field SOPs) and Appendix B (Laboratory SOPs) provide supporting details. Sampling design error is the result of the inherent variability of the sampled population over space and time, the sample collection design, and the number of samples available upon which to base the decision. Because it is impossible to sample every inch of the study area, there is always a possibility that some feature of the natural variability is missed. Sampling design error can increase the chance for misrepresenting the natural variability by random error (imprecision) or systematic error (bias). Because the number of samples controls how well the sampled population is characterized, use of the DQO process requires that the variability of data be understood to evaluate the tradeoff between uncertainty (confidence limit) and sampling intensity. This investigation is meant to supplement characterization of the physical and chemical surficial sediment qualities of the LPRSA using a robust data set. This data set has a characteristic natural variability that will be represented by this data set if all other sources of variability are minimized. The induced variability of the data set can be minimized by reducing the errors associated with samples collection handling, analyses, and reporting with the strict adherence to and use of standardized and documented procedures, as well as the noting of deviations from these procedures. With this minimization of variability, the data set will then be a better representation of the LPRSA sediments allowing improved parameterization of numeric and empirical models with the increased data density. SSP2 sample locaitons were selected to reduce the uncertainity associated with the interpolation observed in the intial mapping results. The data collected during SSP2 will increase the data density around areas with observed elevated concentrations of COCs with the intent to bound the interpolation observed during the initial mapping.
STEP 7 **Develop the detailed plan for obtaining data**	**Sediment Sampling** The currently proposed sampling program (for COPC analyses) will consist of: ▪ 74 sampling locations, 66 core and surface grab locations and 8 grab sample locations ▪ One sampling event (up to 2 months of field work) to minimize temporal variability ▪ At each of the 66 locations, one surface sediment grab sample will be collected using a grab sampler (SOP LPR-S-01) and two to three sediment cores will be collected using a vibracore (where more appropriate for field conditions, a hand-held

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

	coring device, such as a piston push corer will be used). The grab will sample the 0–0.5 foot interval. The two cores will be segmented to sample the 0-0.5 foot interval, two 1-foot intervals to a depth of 2.5 feet depending on the depth native material or refusal, and a final one foot sample collected from the one foot above native material or refusal. One core will be the primary core and the second core will be used if sufficient sample volume is not obtained from the first core. A third core may be necessary to provide sufficient volume for QA/QC samples. Samples from the coring locations will also be collected in one foot intervals and archived. These samples will be collected from the 2.5 foot interval to the top of the one foot sample interval above native material or refusal. Samples should have sufficient mass to analyze for the following suite of analytes. In the event that the sample volume for any sample segment is minimal the priority analyte list will be employed. Additional coring attempts or grab sample attempts beyond 3 to increase sample volume for a vertical segment will not be conducted. ▪ TOC ▪ Total sulfide (grab sample) ▪ Percent moisture ▪ Grain size ▪ Specific gravity ▪ Bulk density (determined in the field facility) ▪ TAL metals and titanium ▪ SVOCs ▪ PAHs and alkyl PAHs ▪ PCBs (homologs and congeners) ▪ PCDDs/PCDFs ▪ Organochlorine pesticides (not including toxaphene) ▪ TPH extractable ▪ Butyltins

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

	Mercury (low-level) ▪ Cyanide ▪ AVS/SEM (grab sample) ▪ Phosphate (total) (grab sample) ▪ TKN (grab sample) ▪ Ammonia as N (grab sample) ▪ Salinity (determined in the field for pore water) Sample interval segments may vary to accommodate collection of distinctly different layers of sediment, as described in Worksheet #17. At core locations, the surface sediment from the grab sampler will initially be used for sulfides, nutrients, AVS/SEM and then for the other COPCs after the sediment sample mass from the vibracores has been exhausted. At locations where only surface sediment grab samples are being collected, the fuil suite of anlaltyes will be collected from the surface sediment from the grab sampler.

Matrix	Sediment				
Analytical Group[a]	SVOCs				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	TA-3, TA-4	Accuracy/Bias-Contamination	No target compounds >QL, no common lab contaminants >5x QL	Method Blank (MB)	A
	TA-3, TA-4	Accuracy/Bias-Contamination	No target compounds >QL, no common lab contaminants >5x QL	Equipment Rinsate Blanks	S&A
	TA-3, TA-4	Accuracy/Bias	See Laboratory %Recovery Control Limits (RCLs) (Appendix B-2)	LCS	A
	TA-3, TA-4	Accuracy/Bias	See Laboratory % RCLs (Appendix B-2)	Matrix Spike (MS)	S&A
	TA-3, TA-4	Accuracy/Bias	See Laboratory % RCLs (Appendix B-2)	Surrogates	A
	TA-3, TA-4	Precision	See Laboratory % RCLs and relative percent difference (RPD) control limits (Appendix B-2)	Matrix Spike Duplicate (MSD)	S&A
	TA-3, TA-4	Precision	RPD ≤ 50% if both samples are > 5x QL	Field Duplicate	S&A
	TA-3, TA-4	Completeness	≥ 90%	Data Completeness Check	S&A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix B-2

Matrix	Sediment				
Analytical Group[a]	PAHs and Alkyl PAHs				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	TA-7, TA-8	Accuracy/Bias-Contamination	No target compounds >QL	MB	A

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

	TA-7, TA-8	Accuracy/Bias-Contamination	No target compounds >QL	Equipment Rinsate Blanks	S&A
	TA-7, TA-8	Accuracy/Bias	See Laboratory %RCLs (Appendix B-2)	LCS	A
	TA-7, TA-8	Accuracy/Bias	See Laboratory %RCLs (Appendix B-2)	MS	S&A
	TA-7, TA-8	Accuracy/Bias	See Laboratory %RCLs (Appendix B-2)	Pre-extraction Internal Standards	A
	TA-7, TA-8	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	TA-7, TA-8	Precision	See Laboratory RPD Control Limits (Appendix B-2)	Laboratory Duplicate	S&A
	TA-7, TA-8	Precision	RPD ≤ 50% if both samples are > 5x QL	Field Duplicate	S&A
	TA-7, TA-8	Completeness	≥ 90%	Data Completeness Check	S&A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix B-2

Matrix	Sediment				
Analytical Group[a]	Organochlorine Pesticides (HRGC/HRMS)				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	TA-11	Accuracy/Bias - Contamination	No target compounds >QL	MB/Instrument Blank	A
	TA-11	Accuracy/Bias-Contamination	No target compounds >QL	Equipment Rinsate Blanks	S&A

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

	TA-11	Accuracy/Bias	See Laboratory %RCLs (Appendix B-2)	On-going Precision and Recovery (OPR) sample (or LCS)	A
	TA-11	Accuracy/Bias	See Laboratory %RCLs (Appendix B-2)	MS	S&A
	TA-11	Accuracy/Bias	See Laboratory %RCLs (Appendix B-2)	Labeled Isotope Dilution Internal Standards	A
	TA-11	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	TA-11	Precision	RPD ≤ 30%	Laboratory Duplicate	S&A
	TA-11	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S&A
	TA-11	Completeness	≥ 90%	Data Completeness Check	S&A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix B-2

Matrix	Sediment				
Analytical Group[a]	PCBs – Congeners and Homologs (HRGC/HRMS)				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	AP-3	Accuracy/Bias-Contamination	No target compounds >1/10 concentration in associated samples	MB/Instrument Blank	A
	AP-3	Accuracy/Bias-Contamination	No target compounds >1/10 concentration in associated samples	Equipment Rinsate Blanks	S&A
			Native compounds by		

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

	AP-3		isotope dilution percent differences (%D) vs initial calibration (ICAL) ≤ 30%; Native compounds measured against an isotopic isomer vs. ICAL %D = 50%; Labeled standard %D vs ICAL ≤ 50%; Native Compound RPDs ≤ 20% for isotope dilution and ≤ 30% for isotopic isomer; Standard RPDs ≤ 50%		
	AP-3	Accuracy/Bias	50-150%R for isotope dilution analytes; 10-200% for isotopic isomer	MS	S&A

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Sampling Procedure[b]	Analytical Method/SOP[c]	DQIs	Measurement Performance Criteria[d]	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04 (con't)	AP-3	Accuracy/Bias	Per EPA Method 1668B Table 6	Pre-extraction Internal Standards	A
	AP-3	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	AP-3	Precision	RPD ≤50% for isotope dilution; RPD ≤ 100% for isotopic isomers	Laboratory Duplicate	S&A
	AP-3	Precision	RPD ≤ 50% if both samples are > 5x EML	Field Duplicate	S&A
	AP-3	Completeness	≥ 90%	Data Completeness Check	S&A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix B-2

Matrix	Sediment				
Analytical Group[a]	TPH, Extractables (Gas Chromatography/Flame Ionization Detector (GC/FID))				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP[c]**	**DQIs**	**Measurement Performance Criteria[d]**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	TA-1	Accuracy/Bias-Contamination	No target compounds >QL	MB	A

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

	TA-1	Accuracy/Bias-Contamination	No target compounds >QL	Equipment Rinsate Blanks	S&A
	TA-1	Accuracy/Bias	65-125%R	LCS	A
	TA-1	Accuracy/Bias	65-130%R	Surrogates	A
	TA-1	Accuracy/Bias	65-125%R	MS	S&A
	TA-1	Precision	65-125%R; RPD ≤ 30%	MSD	S&A
	TA-1	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S&A
	TA-1	Completeness	≥ 90%	Data Completeness Check	S&A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix B-2

Matrix	Sediment				
Analytical Group[a]	PCDDs/PCDFs (Isotope Dilution Mass Spectrometry)				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	AP-1	Accuracy/Bias-Contamination	a)No Target Compound >25% of adjusted QL b)If detected, the concentration should be less than the RL or <10 times the highest concentration found in the sample batch; c) signal to noise should be >10:1 for isotopically labeled standard added before extraction; d) EDL ≤ 50% of the adjusted QL e)recoveries of the isotopically labeled standard should be 40% minimum or meet the requirements of c and d above	MB	A
	AP-1	Accuracy/Bias-Contamination	No target compound >QL	Equipment Rinsate Blanks	S&A

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Sampling Procedure[b]	Analytical Method/SOPc	DQIs	Measurement Performance Criteriad	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04 (con't)	AP-1	Accuracy/Bias	Supplier Certified Limits	CRM	A
	AP-1	Sensitivity	EDL<DQL, with the exception of 2,3,7,8-TCDD	Labeled Compounds	A
	AP-1	Accuracy/Bias	Native compound %D (vs. ICAL) ≤ 20%; Labeled Standard %D (vs. ICAL) ≤ 30%; Native Compound RPDs ≤ 10%; Labeled Standard RPDs ≤ 20%	Batch Control Spike	A
	AP-1	Accuracy/Bias	75-125%R	MS	S & A
	AP-1	Precision	RPD < 25%	Laboratory Duplicate	S
	AP-1	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	AP-1	Accuracy/Bias	Within statistical control limits	QC Standard	A
	AP-1	Precision	RPD ≤ 50% if both samples are > 5x QL	Field Duplicate	S&A
	AP-1	Completeness	≥ 90%	Data Completeness Check	S&A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix B-2

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	Inductively Coupled Plasma – Atomic Emission Spectrometry (ICP/AES) Metals				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	C-4, C-5	Accuracy/Bias-Contamination	No target analytes >QL	MB	A
	C-4, C-5	Accuracy/Bias-Contamination	No target analytes >QL	Equipment Rinsate Blanks	S&A
	C-4, C-5	Accuracy/Bias	See Laboratory %RCLs (Appendix B-2)	LCS	A
	C-4, C-5	Accuracy/Bias	See Laboratory %RCLs (Appendix B-2)	MS	S&A
	C-4, C-5	Precision	RPD ≤ 30%	Laboratory Duplicate	A
	C-4, C-5	Precision	RPD ≤ 35% if both samples are >5x QL	Field Duplicate	S&A
	C-4, C-5	Completeness	≥ 90%	Data Completeness Check	S&A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix B-2

Matrix	Sediment	
Analytical Group[a]	Inductively Coupled Plasma – Mass Spectrometry (ICP/MS) Metals	
Concentration Level	Low	

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Sampling Procedure[b]	Analytical Method/SOP[c]	DQIs	Measurement Performance Criteria[d]	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	C-4, C-6	Accuracy/Bias-Contamination	No target analytes >QL	MB	A
	C-4, C-6	Accuracy/Bias-Contamination	No target analytes >QL	Equipment Rinsate Blanks	S&A
	C-4, C-6	Accuracy/Bias	See Laboratory %RCLs (Appendix B-2)	LCS	A
	C-4, C-6	Accuracy/Bias	See Laboratory %RCLs (Appendix B-2)	MS	S&A
	C-4, C-6	Precision	RPD ≤ 20%	Laboratory Duplicate	A
	C-4, C-6	Precision	RPD ≤ 35% if both samples are > 5x QL	Field Duplicate	S&A
	C-4, C-6	Completeness	≥ 90%	Data Completeness Check	S&A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix B-2

Matrix	Sediment				
Analytical Group[a]	Low Level Mercury				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	BR-1	Accuracy/Bias-Contamination	Average MB <2x Method Detection Limit (MDL) and standard deviation <0.67x MDL or <0.1x the concentration of project samples	MB	A
	BR-1	Accuracy/Bias-Contamination	No target analytes >QL	Equipment Rinsate Blanks	S&A
	BR-1	Accuracy/Bias	Supplier Certified Limits	CRM (used as LCS)	A
	BR-1	Accuracy/Bias	70 -130%R	MS	S&A
	BR-1	Precision	70 -130%R; RPD ≤ 30%	MSD	S&A
	BR-1	Precision	RPD ≤ 30%	Laboratory Duplicate	A
	BR-1	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S&A
	BR-1	Completeness	≥ 90%	Data Completeness Check	S&A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23

Matrix	Sediment				
Analytical Group[a]	Butyltins				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	C-1, C-2	Accuracy/Bias-Contamination	No target compounds >QL	MB	A
	C-1, C-2	Accuracy/Bias-Contamination	No target compounds >QL	Equipment Rinsate Blanks	S&A

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

	C-1, C-2	Accuracy/Bias	See Laboratory %RCLs (Appendix B-2)	LCS	A
	C-1, C-2	Accuracy/Bias	See Laboratory %RCLs (Appendix B-2)	MS	S&A
	C-1, C-2	Precision	See Laboratory %RCLs/RPD Control Limits (Appendix B-2)	MSD	S&A
	C-1, C-2	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S&A
	C-1, C-2	Completeness	≥ 90%	Data Completeness Check	S&A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix B-2

Matrix	Sediment				
Analytical Group[a]	General Chemistry - Sulfides				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	C-11	Accuracy/Bias-Contamination	No Target Analyte>QL	MB	A
	C-11	Accuracy/Bias-Contamination	No Target Analyte>QL	Equipment Rinsate Blanks	S&A
	C-11	Accuracy/Bias	55-130%R (see Appendix B-2)	LCS	A
	C-11	Accuracy/Bias	45-150%R (see Appendix B-2)	MS	S&A
			RPD ≤ 20% (see		

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

	C-11		Appendix B-2)		
	C-11	Precision	RPD ≤ 50% if both samples are > 5x QL	Field Duplicate	S&A
	C-11	Completeness	≥ 90%	Data Completeness Check	S&A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23

Matrix	Sediment				
Analytical Group[a]	General Chemistry – AVS/SEM				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01	C-15, C-5, C-19	Accuracy/Bias-Contamination	No Target Analytes>QL	MB	A
	C-15, C-5, C-19	Accuracy/Bias	60-115%R for sulfide; See Laboratory %RCLs for metals (Appendix B-2)	LCS	A
	C-15, C-5, C-19	Accuracy/Bias	56-142%R for sulfide; See Laboratory %RCLs for metals (Appendix B-2)	MS	S&A
	C-15, C-5, C-19	Precision	RPD ≤ 20% for sulfide; ≤30% for metals	Laboratory Duplicate	A
	C-15, C-5, C-19	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S&A
	C-15, C-5, C-19	Completeness	≥ 90%	Data Completeness Check	S&A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix B-2

Matrix	Sediment				
Analytical Group[a]	General Chemistry – Ammonia-N				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01	C-17	Accuracy/Bias-Contamination	No Target Analyte>QL	MB	A
	C-17	Accuracy/Bias-Contamination	No Target Analyte>QL	Equipment Rinsate Blanks	S&A
	C-17	Accuracy/Bias	90-110%R (see Appendix B-2)	LCS	A
	C-17	Accuracy/Bias	55-135%R (see Appendix B-2)	MS	S&A
	C-17	Precision	RPD ≤ 20% (see Appendix B-2)	Laboratory Duplicate	A
	C-17	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S&A
	C-17	Completeness	≥ 90%	Data Completeness Check	S&A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23

Matrix	Sediment
Analytical Group[a]	General Chemistry – Cyanide
Concentration Level	Low

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Sampling Procedure[b]	Analytical Method/SOP[c]	DQIs	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	C-10	Accuracy/Bias-Contamination	No Target Analyte>QL	MB	A
	C-10	Accuracy/Bias-Contamination	No Target Analyte>QL	Equipment Rinsate Blanks	S&A
	C-10	Accuracy/Bias	78-110%R (see Appendix B-2)	LCS	A
	C-10	Accuracy/Bias	10-165%R (see Appendix B-2)	MS	S&A
	C-10	Precision	RPD ≤ 20% (see Appendix B-2)	Laboratory Duplicate	A
	C-10	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S&A
	C-10	Completeness	≥ 90%	Data Completeness Check	S&A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23

Matrix	Sediment				
Analytical Group[a]	General Chemistry – TKN				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	C-16	Accuracy/Bias-Contamination	No Target Analyte>QL	MB	A

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

	C-16	Accuracy/Bias-Contamination	No Target Analyte>QL	Equipment Rinsate Blanks	S&A
	C-16	Accuracy/Bias	75-130%R (see Appendix B-2)	LCS	A
	C-16	Accuracy/Bias	23-174%R (see Appendix B-2)	MS	S&A
	C-16	Precision	RPD ≤ 20% (see Appendix B-2)	Laboratory Duplicate	A
	C-16	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S&A
	C-16	Completeness	≥ 90%	Data Completeness Check	S&A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23

Matrix	Sediment				
Analytical Group[a]	General Chemistry – Phosphorus				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	C-18	Accuracy/Bias-Contamination	No Target Analyte>QL	MB	A
	C-18	Accuracy/Bias-Contamination	No Target Analyte>QL	Equipment Rinsate Blanks	S & A
	C-18	Accuracy/Bias	85- 115%R (see Appendix B-2)	LCS	A
	C-18	Accuracy/Bias	75 -125%R (see Appendix B-2)	MS	S & A

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

	C-18	Precision	RPD ≤ 20% (see Appendix B-2)	Laboratory Duplicate	A
	C-18	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S & A
	C-18	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix B-2

Matrix	Sediment				
Analytical Group[a]	General Chemistry – TOC				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	C-13	Accuracy/Bias-Contamination	No Target Analyte>QL	MB	A
	C-13	Accuracy/Bias-Contamination	No Target Analyte>QL	Equipment Rinsate Blanks	S & A
	C-13	Accuracy/Bias	74-118%R (see Appendix B-2)	LCS	A
	C-13	Accuracy/Bias	69-123%R (see Appendix B-2)	MS	S & A
	C-13	Precision	RPD ≤ 20% (see Appendix B-2)	Laboratory Duplicate	A
	C-13	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S & A
	C-13	Completeness	≥ 90%	Data Completeness Check	S & A

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23

Matrix	Sediment				
Analytical Group[a]	Physical Testing – Grain Size Analysis				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	GT-2	Precision	RPD ≤ 20%	Laboratory Duplicates	S & A
	GT-2	Precision	RPD ≤ 50%	Field Duplicate	S & A
	GT-2	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23

Matrix	Sediment				
Analytical Group[a]	General Chemistry – Specific Gravity				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**Analytical Method/SOP**[c]
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	GT-3	Precision	RPD ≤ 20%	Laboratory Duplicates	A
	GT-3	Precision	RPD ≤ 50%	Field Duplicate	S & A
	GT-3	Completeness	≥ 90%	Data Completeness Check	S & A

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/Collection Dates)	How Data Will Be Used	Limitations on Data Use
Work Performed by USEPA/MPI or other agencies on the Passaic River				
Probing and core data from pre-coring reconnaissance work	USEPA sampling program conducted by MPI in 2007-08	USEPA. Inference on sediment type and thickness (probing) as well as sediment description (cores)	Recent surficial sediment conditions.	Subjective delineation and identification method subject to different interpretations. Comparison of core logs and these data required to verify results.
Analytical data from the LPR High Resolution Coring program	USEPA sampling program conducted by MPI in 2005	USEPA. Sediment dating (Cs-137, Beryllium-7 [Be-7]) and contaminant concentrations (PCDD/PCDF, PCBs, PAHs, pesticides, metals). Cores collected Sept. 19 to Oct. 12, 2005.	Map aerial and vertical chemical distribution	Only 5 sediment cores were analyzed for limited and selected chemical parameters. 14 analyzed for Cs-137 over a 10 mile interval. Not all segments from all cores were analyzed. Core in erosional areas were either not utilized or not fully analyzed. Several cores did not produce recovery called for in SOPs. Summary narrative provided. Characterization report not produced to document field or analytical activities. Use data with the recognition that laboratory and/or validation qualifiers may impose limitations on specific datasets and/or data points.
Analytical data from grab samples and sediment cores	USEPA Empirical Mass Balance Model (EMBM) Sampling Program, conducted Dec 2007 – Feb 2008	USEPA. Sediment cores and grabs analyzed for organic and inorganic contaminants	Evaluation of various organic and inorganic chemicals	Samples collected using vibracoring should be interpreted noting individual core recovery and the uncertainty of vertical placement of the recovered samples. Use data with the recognition that laboratory and/or validation qualifiers may impose limitations on specific datasets and/or data points.
Analytical data from the grab samples collected for sediment dating	USEPA sampling program conducted by MPI in 2005	USEPA (collected by MPI) - Aug 2005 - 45 locations - Be-7	Provide insight into potential deposition areas	Characterization report not produced to document field or analytical activities. Use data with the recognition that laboratory and/or validation qualifiers may impose limitations on specific datasets and/or data points.

QAPP Worksheet #13 (UFP-QAPP Manual Section 2.7) Secondary Data Criteria and Limitations Table

Work Performed by Tierra Solutions, Inc. on the Passaic River				
Analytical data from the LPR coring program	Tierra Solutions, Inc. Newark Bay Study Area RI Work Plan	Tierra Solutions Inc. Sediment chemistry collected from 93 sediment core locations (658 samples) for chemical, radiological and geotechnical analysis.	Evaluation of various organic and inorganic chemicals	Samples collected using vibracoring should be interpreted noting individual core recovery and the uncertainty of vertical placement of the recovered samples. Use data with the recognition that laboratory and/or validation qualifiers may impose limitations on specific datasets and/or data points.
Work Performed by CPG/AECOM on the Passaic River				
Aerial Photography and Digital Orthophotos, photogrammetric mapping and topography	CPG, LPRSA.	Produced by GEOD Corp on behalf of CPG. Data sent to USEPA in November and December 2007.	In completion of RI/FS	Orthophotos - Valid for accuracy and map scales as explained in the metadata. Current only as of the date of photography, 3/12/2007 Photogrammetric Mapping Products - Valid for accuracy and map scales as explained in the metadata. Current only as of the date of photography, 4/11/2007.

QAPP Worksheet #13 (UFP-QAPP Manual Section 2.7) Secondary Data Criteria and Limitations Table

Bathymetric surveys	CPG August – September 2007 Bathymetry Survey, June 2010 Multibeam Survey, April 2011 Multibeam Survey, October – November 2011 Multibeam Survey, Multibeam and Single-Beam Survey, August – September 2012.	CPG. Multi-beam and single beam survey performed by Gahagan & Bryant Associates, Inc. (GBA) (subcontractor to ENSR) in Aug-Sept 2007 and Aug-Sept, 2012; Multibeam surveys performed by GBA (subcontractor to AECOM) in November 2008, June 2010, and October – November 2011.	Characterize existing bathymetry, compare with previous surveys to assess sediment stability	Single beam – 2007 coverage limited to project RM 0.5 - 8.2 and 14.3 - 16.5. Current only as of the date of survey, August 2007. 2012 coverage limited to project RM 0 - 0.9, RM 1.8 - 3.05, RM 3.5 - 4.2, RM 6.6 - 7.1, RM 7.1 - 7.5 RM 7.5 - 7.8 RM 9.6 - 10.2, RM 10.5 – 11, RM11.20 and Third River. Current only as of the data of survey, August – September 2012. Multi-beam coverage limited to RM 0 - 14.4, and to channel area in RM 0 - 0.9. Current only as of the date of survey, August 2007, November 2008, June 2010, October – November 2011, and August – September 2012. Multi-beam coverage limited to RM 0 - 14.4, and to channel area in RM 0 - 0.9. Limited to water depth of -6 feet National Geodetic Vertical Datum (NGVD). Current only as of the date of surveys.
Analytical data from the LPR low resolution coring program (LRC) and LRC supplemental sediment sampling (SSP) coring program	Draft report to USEPA 2/28/2010 (LRC) and in draft report in progress (LRC SSP)	CPG. Sediment chemistry collected from 110 (LRC) and 85 (LRC SSP) sediment core locations and co-located grab locations for chemical, radiological and geotechnical analysis.	Evaluation of various organic, inorganic chemicals, radiochemistry, and geotechnical data	Samples collected using vibracoring should be interpreted noting individual core recovery and the uncertainty of vertical placement of the recovered samples. Use data with the recognition that laboratory and/or validation qualifiers may impose limitations on specific datasets and/or data points.
Work Performed by CPG/Windward on the Passaic River				

QAPP Worksheet #13 (UFP-QAPP Manual Section 2.7) Secondary Data Criteria and Limitations Table

Analytical sediment data from the LPR benthic program	No report to date	CPG. Sediment chemistry collected from 116 grab locations for chemical analysis.	Evaluation of various organic and inorganic chemicals	Use data with the recognition that laboratory and/or validation qualifiers may impose limitations on specific datasets and/or data points.

Sampling Tasks: The sediment characterization program includes the combination of both sediment grabs and core samples. A sediment grab sample will be collected at each station using a grab sampler. The grab sampling effort will yield a surface sediment sample from 0 to 0.5 foot below the sediment-water interface. At core locations the sediment grab sample will provide sufficient sediment volume for analysis of specific target analytes (e.g., sulfides, nutrients and AVS/SEM), as well as additional volume, if needed beyond that collected by the vibracores, to meet the analytical chemistry requirements for the 0 to 0.5 foot sample depth. At surface grab sample locations where cores are not collected, the sediment grab sample will provide sufficient sediment volume to meet the complete analytical chemistry requirements for the 0 to 0.5 foot sample depth.

A vibracore system (or piston push core) will be used to collect two to three cores at each location for chemical and physical analysis. The cores will be used for analyses for the suite of physical and chemical analytes.

Samples will be processed and transferred to sample containers at the CPG field facility.

Low Resolution Cores

One set of cores from all 66 locations (Figure 1) will be sampled using the following low resolution sampling intervals. Samples from the core locations will be collected from the following sampling intervals: the 0 to 0.5 foot surface interval (from the core and grab sample), one to two 1-foot segments (0.5 to 1.5 and 1.5 to 2.5 feet) depending on depth to native material or refusal, and a final one foot sample collected from the one foot above native material or refusal. No more than three coring attempts will be advanced at any proposed coring location. If refusal is met in these three attempts; a surface grab sample will collected if possible. No more than three attempts will be made to collect a grab sample. In the event that the sample volume for any sample segment is minimal the priority analyte list will be employed. Additional coring attempts or grab sample events beyond 3 to increase volume for a vertical segment will not be conducted

Samples from the coring locations will also be collected in one foot intervals and archived. These samples will be collected from the 2.5 foot interval to the top of the one foot sample interval above native material or refusal.

Under certain conditions, the segmentation scheme may be altered to adjust the sampling intervals. For example, where a stratigraphic change in the sediment sequence (e.g., change in sediment size, obvious depositional boundary or unconformity) occurs within a segment, the sampling of that segment may be altered. This will prevent different material types, with possibly different depositional ages, from being mixed together in the same sample. Segments will be reduced to less than 1-foot only where it appears that the sediment density is such that sufficient solids are present to satisfy the laboratory sample volume requirement. These adjustments, if made, will not eliminate the collection of a sample interval.

QAPP Worksheet #14 (UFP-QAPP Manual Section 2.8.1) Summary of Project Tasks

Surface Grab Samples

In addition to the 66 low resolution core locations, surface grab samples will be collected from 8 locations (Figure 1). Surface grab samples will be collected from the 0 to 0.5 foot surface interval. No more than three attempts will be made to collect a grab sample. In the event that the sample volume for the surface interval is minimal the priority analyte list will be employed. Additional grab sample events beyond 3 to increase volume for a surface segment will not be conducted.

A comprehensive list of physical, inorganic and organic chemical analyses is proposed for the set of 74 locations. This list includes PCDDs/ PCDFs, PCB congeners and homologs, PAHs, SVOCs, organochlorine pesticides, butyltins, metals, mercury, TPH-extractables, cyanide, TOC, grain size, percent moisture, and specific gravity. Sulfide, nutrients (ammonia-nitrogen, phosphorus, and TKN) and AVS/SEM will be collected from surficial samples only and will be collected from the surface grab sample.

Field measurements will include salinity measurement of pore water from grab samples and measurement of bulk density. Physical and chemical tests will be performed on the sediment samples at fixed laboratories according to methods listed in Worksheet #23.

Quality Control Tasks: QC samples have been defined for the field and laboratory efforts. Field QC samples are summarized on Worksheet #20; laboratory QC samples are summarized on Worksheet #28.

Secondary Data: All relevant secondary/historical data are summarized on Worksheet #13.

Data Management Tasks: AECOM's DMP (AECOM, 2010a) covers all field-collected and laboratory-generated records/data. The handling of records and data is summarized on Worksheet #29.

Documentation and Records: Project related records (field, sample transfer/chain of custody, laboratory) are summarized on Worksheet #29.

Assessment/Audit Tasks: Field and laboratory audits are scheduled in accordance with Worksheet #31.

Data Review Tasks: Field data will be reviewed as described in Worksheet #34. Laboratories are contractually required to verify all laboratory data including EDDs as summarized in Worksheet #34. Data validation and usability assessments will be conducted as detailed in Worksheets #35, 36, and 37.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

Matrix: Sediment
Analytical Group: PCBs – Homologs and Congeners; Method 1668A; SGS - Analytical Perspectives, Wilmington, NC
Concentration Level: Low

Analyte	CAS Number	Data Quality Level (DQL) (mg/kg)[a]	Sediment Reporting Limits (RLs) from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	Estimated Detection Limits (EDLs)[f] (mg/kg)	QLs (mg/kg)
Monochlorobiphenyl	27323-18-8	0.0227	NA	0.0030	NA	NA	NA	0.0000025
Dichlorobiphenyl	25512-42-9	0.0227	NA	0.0030	NA	NA	NA	0.0000050
Trichlorobiphenyl	25323-68-6	0.0227	NA	0.0030	NA	NA	NA	0.0000025
Tetrachlorobiphenyl	26914-33-0	0.0227	NA	0.0030	NA	NA	NA	0.0000025
Pentachlorobiphenyl	25429-29-2	0.0227	NA	0.0030	NA	NA	NA	0.0000025
Hexachlorobiphenyl	26601-64-9	0.0227	NA	0.0030	NA	NA	NA	0.0000025
Heptachlorobiphenyl	28655-71-2	0.0227	NA	0.0030	NA	NA	NA	0.0000025
Octachlorobiphenyl	55722-26-4	0.0227	NA	0.0030	NA	NA	NA	0.0000025
Nonachlorobiphenyl	53742-07-7	0.0227	NA	0.0030	NA	NA	NA	0.0000025
Decachlorobiphenyl	2051-24-3	0.0227	NA	0.0030	NA	NA	NA	0.0000025
Congeners, Individual - PCB-1 through PCB-209	See below	0.0227	0.0000002 through 0.000002	0.0000002 through 0.000002	0.00000050	0.0000010	0. 00000018 through 0. 0000235 (see below)	0.0000010 through 0.0000100 (see below)
PCB 1	2051-60-7	0.0227	See above[f]	See above[f]	0.0000080	0.000020	0. 00000804	0.000001
PCB 2	2051-61-8	0.0227	See above[f]	See above[f]	0.00000040	0.0000010	0. 000008957	0.000001
PCB 3	2051-62-9	0.0227	See above[f]	See above[f]	0.0000090	0.000020	0. 000000951	0.000001
PCB 4	13029-08-8	0.0227	See above[f]	See above[f]	0.000017	0.000050	0. 0000114	**0.000005**
PCB 5	16605-91-7	0.0227	See above[f]	See above[f]	0.0000010	0.0000050	0. 0000127	**0.000005**
PCB 6	25569-80-6	0.0227	See above[f]	See above[f]	0.0000010	0.0000050	0. 00000898	0.000001

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

PCB 7	33284-50-3	0.0227	See above[f]	See above[f]	0.0000020	0.0000050	0. 0000115	**0.000005**
PCB 8	34883-43-7	0.0227	See above[f]	See above[f]	0.000012	0.000050	0. 00000958	0.000001
PCB 9	34883-39-1	0.0227	See above[f]	See above[f]	0.000002	0.000005	0. 0000101	**0.000005**
PCB 10	33146-45-1	0.0227	See above[f]	See above[f]	0.000002	0.000005	0. 0000128	**0.000005**
PCB 11	2050-67-1	0.0227	See above[f]	See above[f]	0.000010	0.000020	0. 000019	**0.000004**
PCB 12+ PCB 13	2974-92-7; 2974-90-5	0.0227	See above[f]	See above[f]	0.0000030	0.000010	0. 0000114	**0.000005**
PCB 14	34883-41-5	0.0227	See above[f]	See above[f]	0.0000030	0.000010	0. 0000117	**0.000005**
PCB 15	2050-68-2	0.0227	See above[f]	See above[f]	0.000018	0.000050	0. 00000063	0.000001
PCB 16	38444-78-9	0.0227	See above[f]	See above[f]	0.000004	0.000010	0. 000001879	0.000001
PCB 17	37680-66-3	0.0227	See above[f]	See above[f]	0.0000090	0.000020	0. 00000327	0.000001
PCB 18 + PCB 30	37680-65-2; 35693-92-6	0.0227	See above[f]	See above[f]	0.000017	0.000050	0. 00001177	**0.000005**
PCB 19	38444-73-4	0.0227	See above[f]	See above[f]	0.0000040	0.000010	0. 00000281	0.000001
PCB 20 + PCB 28	38444-84-7; 7012-37-5	0.0227	See above[f]	See above[f]	0.000019	0.000050	0. 0000235	**0.000008**
PCB 21 + PCB 33	55702-46-0; 38444-86-9	0.0227	See above[f]	See above[f]	0.000005	0.000020	0. 00001085	**0.000005**
PCB 22	38444-85-8	0.0227	See above[f]	See above[f]	0.0000090	0.000020	0. 000004629	0.000001
PCB 23	55720-44-0	0.0227	See above[f]	See above[f]	0.0000050	0.000020	0. 00000365	0.000001
PCB 24	55702-45-9; 38444-76-7	0.0227	See above[f]	See above[f]	0.0000050	0.000020	0. 00000283	0.000001
PCB 25	55712-37-3	0.0227	See above[f]	See above[f]	0.0000050	0.000020	0. 00000134	0.000001
PCB 26 + PCB 29	38444-81-4; 15862-07-4	0.0227	See above[f]	See above[f]	0.000008	0.000020	0. 000000535	0.000001
PCB 27	38444-76-7	0.0227	See above[f]	See above[f]	0.000006	0.000020	0. 00000208	0.000001
PCB 31	16606-02-3	0.0227	See above[f]	See above[f]	0.000015	0.000050	0. 00001573	**0.000005**
PCB 32	38444-77-8	0.0227	See above[f]	See above[f]	0.000008	0.000020	0. 000003505	0.000001
PCB 34	37680-68-5	0.0227	See above[f]	See above[f]	0.0000070	0.000020	0. 00000331	0.000001

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

PCB 35	37680-69-6	0.0227	See above[f]	See above[f]	0.0000080	0.000020	0. 00000265	0.000001
PCB 36	38444-87-0	0.0227	See above[f]	See above[f]	0.0000080	0.000020	0. 00000299	0.000001
PCB 37	38444-90-5	0.0227	See above[f]	See above[f]	0.000013	0.000050	0. 000003562	0.000001
PCB 38	53555-66-1	0.0227	See above[f]	See above[f]	0.0000080	0.000020	0. 00000355	0.000001
PCB 39	38444-88-1	0.0227	See above[f]	See above[f]	0.0000090	0.000020	0. 00000295	0.000001
PCB 40 + PCB 71	38444-93-8; 41464-46-4	0.0227	See above[f]	See above[f]	0.000012	0.000050	0. 000000568	0.000001
PCB 41	52663-59-9	0.0227	See above[f]	See above[f]	0.000012	0.000050	0. 00000323	0.000001
PCB 42	36559-22-5	0.0227	See above[f]	See above[f]	0.000006	0.000020	0. 00000156	0.000001
PCB 43	70362-46-8	0.0227	See above[f]	See above[f]	0.000009	0.000020	0. 00000423	0.000001
PCB 44 + PCB 47 + PCB 65	41464-39-5; 2437-79-8; 33284-54-7	0.0227	See above[f]	See above[f]	0.000019	0.000050	0. 000009859	0.000001
PCB 45	70362-45-7	0.0227	See above[f]	See above[f]	0.0000050	0.000020	0. 00000281	0.000001
PCB 46	41464-47-5	0.0227	See above[f]	See above[f]	0.000010	0.000020	0. 00000372	0.000001
PCB 48	70362-47-9	0.0227	See above[f]	See above[f]	0.000008	0.000020	0. 00000146	0.000001
PCB 49 + PCB 69	41464-40-8; 60233-24-1	0.0227	See above[f]	See above[f]	0.000011	0.000050	0. 000003962	0.000001
PCB 50 + PCB 53	62796-65-0; 41464-41-9	0.0227	See above[f]	See above[f]	0.000006	0.000020	0. 00000201	0.000001
PCB 51	68194-04-7	0.0227	See above[f]	See above[f]	0.0000060	0.000020	0. 00000319	0.000001
PCB 52	35693-99-3	0.0227	See above[f]	See above[f]	0.000019	0.000050	0. 0000133	**0.000005**
PCB 54	15968-05-5	0.0227	See above[f]	See above[f]	0.000012	0.000050	0. 00000278	0.000001
PCB 55	74338-24-2	0.0227	See above[f]	See above[f]	0.000012	0.000050	0. 00000321	0.000001
PCB 56	41464-43-1				0.000010	0.000020	0. 00000018	0.000001
PCB 57	70424-67-8	0.0227	See above[f]	See above[f]	0.000012	0.000050	0. 00000346	0.000001
PCB 58	41464-49-7	0.0227	See above[f]	See above[f]	0.000013	0.000050	0. 00000312	0.000001
PCB 59 + PCB 62 + PCB 75	74472-33-6; 54230-22-7; 32598-12-2	0.0227	See above[f]	See above[f]	0.000006	0.000020	0. 00000225	0.000001

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

PCB 60	33025-41-1	0.0227	See above[f]	See above[f]	0.000013	0.000050	0. 00000151	0.000001
PCB 61 + PCB 70 + PCB 74 + PCB 76	33284-53-6; 32598-11-1; 32690-93-0; 70362-48-0	0.0227	See above[f]	See above[f]	0.000017	0.000050	0. 00001057	**0.000005**
PCB 63	74472-34-7	0.0227	See above[f]	See above[f]	0.000014	0.000050	0. 0000313	**0.000010**
PCB 64	52663-58-8	0.0227	See above[f]	See above[f]	0.000007	0.000020	0. 000001584	0.000001
PCB 66	32598-10-0	0.0227	See above[f]	See above[f]	0.000016	0.000050	0. 000003628	0.000001
PCB 67	73575-53-8	0.0227	See above[f]	See above[f]	0.000015	0.000050	0. 00000281	0.000001
PCB 68	73575-52-7	0.0227	See above[f]	See above[f]	0.000015	0.000050	0. 00000322	0.000001
PCB 72	41464-42-0	0.0227	See above[f]	See above[f]	0.000016	0.000050	0. 00000305	0.000001
PCB 73	74338-23-1	0.0227	See above[f]	See above[f]	0.000017	0.000050	0. 00000286	0.000001
PCB 77	32598-13-3	0.0227	See above[f]	See above[f]	0.000017	0.000050	0. 00000301	0.000001
PCB 78	70362-49-1	0.0227	See above[f]	See above[f]	0.000017	0.000050	0. 00000332	0.000001
PCB 79	41464-48-6	0.0227	See above[f]	See above[f]	0.000017	0.000050	0. 00000275	0.000001
PCB 80	33284-52-5	0.0227	See above[f]	See above[f]	0.000018	0.000050	0. 00000321	0.000001
PCB 81	70362-50-4	0.0227	See above[f]	See above[f]	0.000018	0.000050	0. 00000370	0.000001
PCB 82	52663-62-4	0.0227	See above[f]	See above[f]	0.000013	0.000050	0. 00000365	0.000001
PCB 83	60145-20-2	0.0227	See above[f]	See above[f]	0.000022	0.000050	0. 00000411	0.000001
PCB 84	52663-60-2	0.0227	See above[f]	See above[f]	0.000012	0.000050	0. 00000206	0.000001
PCB 85 + PCB 116	65510-45-4; 18259-05-7	0.0227	See above[f]	See above[f]	0.000010	0.000020	0. 00000296	0.000001
PCB 86 + PCB 87 + PCB 97 + PCB 108 + PCB 119 + PCB 125	55312-69-1; 38380-02-8; 41464-51-1; 70362-41-3; 56558-17-9; 74472-39-2	0.0227	See above[f]	See above[f]	0.000027	0.000100	0. 000001935	0.000001
PCB 88	55215-17-3	0.0227	See above[f]	See above[f]	0.000012	0.000050	0. 00000485	**0.000010**
PCB 89	73575-57-2	0.0227	See above[f]	See above[f]	0.000019	0.000050	0. 00000403	0.000001

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

PCB 90 + PCB 101 + PCB 113	68194-07-0; 37680-73-2; 68194-10-5	0.0227	See above[f]	See above[f]	0.000024	0.000100	0. 000005444	0.000001
PCB 91	68194-05-8	0.0227	See above[f]	See above[f]	0.000012	0.000050	0. 00000283	0.000001
PCB 92	52663-61-3	0.0227	See above[f]	See above[f]	0.000012	0.000050	0. 00000304	0.000001
PCB 93 + PCB 100	73575-56-1; 39485-83-1	0.0227	See above[f]	See above[f]	0.000022	0.000050	0. 00000379	0.000001
PCB 94	73575-55-0	0.0227	See above[f]	See above[f]	0.000022	0.000050	0. 00000459	0.000001
PCB 95	38379-99-6	0.0227	See above[f]	See above[f]	0.000022	0.000050	0. 000005012	0.000001
PCB 96	73575-54-9	0.0227	See above[f]	See above[f]	0.000021	0.000050	0. 00000286	0.000001
PCB 98	60233-25-2	0.0227	See above[f]	See above[f]	0.000022	0.000050	0. 00000394	**0.000010**
PCB 99	38380-01-7	0.0227	See above[f]	See above[f]	0.000022	0.000050	0. 00000049	0.000001
PCB 102	68194-06-9	0.0227	See above[f]	See above[f]	0.000022	0.000050	0. 00000380	0.000001
PCB 103	60145-21-3	0.0227	See above[f]	See above[f]	0.000023	0.000050	0. 00000337	0.000001
PCB 104	56558-16-8	0.0227	See above[f]	See above[f]	0.000023	0.000050	0. 00000304	0.000001
PCB 105	32598-14-4	0.0227	See above[f]	See above[f]	0.000011	0.000002	0. 00000103	0.000001
PCB 106	70424-69-0	0.0227	See above[f]	See above[f]	0.000014	0.000050	0. 00000298	0.000001
PCB 107 + PCB 124	70424-68-9; 70424-70-3	0.0227	See above[f]	See above[f]	0.000027	0.000100	0. 00000300	0.000001
PCB 109	74472-35-8	0.0227	See above[f]	See above[f]	0.000015	0.000050	0. 00000253	0.000001
PCB 110	38380-03-938-1	0.0227	See above[f]	See above[f]	0.000024	0.00010	0. 000004554	0.000001
PCB 111	39635-32-0	0.0227	See above[f]	See above[f]	0.000024	0.000100	0. 00000317	0.000001
PCB 112	74472-36-9	0.0227	See above[f]	See above[f]	0.000025	0.000100	0. 00000290	0.000001
PCB 114	74472-37-0	0.0227	See above[f]	See above[f]	0.000012	0.000050	0. 00000309	0.000001
PCB 115	74472-38-1	0.0227	See above[f]	See above[f]	0.000024	0.000100	0. 00000269	0.000001
PCB 117	68194-11-6	0.0227	See above[f]	See above[f]	0.000010	0.000020	0. 00000309	0.000001
PCB 118	31508-00-6	0.0227	See above[f]	See above[f]	0.000019	0.000050	0. 000003306	0.000001
PCB 120	68194-12-7	0.0227	See above[f]	See above[f]	0.000015	0.000050	0. 00000280	0.000001

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

PCB 121	56558-18-0	0.0227	See above[f]	See above[f]	0.000021	0.000050	0. 00000321	0.000001
PCB 122	76842-07-4	0.0227	See above[f]	See above[f]	0.000012	0.000050	0. 00000333	0.000001
PCB 123	65510-44-3	0.0227	See above[f]	See above[f]	0.000015	0.000050	0. 00000339	0.000001
PCB 126	57465-28-8	0.000034	See above[f]	See above[f]	0.000014	0.000050	0. 00000340	0.000001
PCB 127	39635-33-1	0.0227	See above[f]	See above[f]	0.000028	0.00010	0. 00000324	0.000001
PCB 128 + PCB 166	38380-07-3; 41411-63-6	0.0227	See above[f]	See above[f]	0.000012	0.000050	0. 00000329	0.000001
PCB 129 + PCB 138 + PCB 163	55215-18-4; 35065-28-2-; 74472-44-9	0.0227	See above[f]	See above[f]	0.000021	0.000050	0. 000002702	0.000001
PCB 130	52663-66-8	0.0227	See above[f]	See above[f]	0.000014	0.000050	0. 00000375	0.000001
PCB 131	61798-70-7	0.0227	See above[f]	See above[f]	0.000012	0.000050	0. 00000335	0.000001
PCB 132	38380-05-1	0.0227	See above[f]	See above[f]	0.000012	0.000050	0. 00000238	0.000001
PCB 133	35694-04-3	0.0227	See above[f]	See above[f]	0.000017	0.000050	0. 00000360	0.000001
PCB 134	52704-70-8	0.0227	See above[f]	See above[f]	0.000013	0.000050	0. 00000388	0.000001
PCB 135 + PCB 151	52744-13-5; 52663-63-5	0.0227	See above[f]	See above[f]	0.000011	0.000050	0. 00000205	0.000001
PCB 136	38411-22-2	0.0227	See above[f]	See above[f]	0.0000090	0.000020	0. 00000201	0.000001
PCB 137	35694-06-5	0.0227	See above[f]	See above[f]	0.000030	0.00010	0. 00000351	0.000001
PCB 139 + PCB 140	56030-56-9; 59291-64-4	0.0227	See above[f]	See above[f]	0.000020	0.000050	0. 00000342	0.000001
PCB 141	52712-04-6	0.0227	See above[f]	See above[f]	0.0000090	0.000020	0. 00000257	0.000001
PCB 142	41411-61-4	0.0227	See above[f]	See above[f]	0.000031	0.000100	0. 00000402	0.000001
PCB 143	68194-15-0	0.0227	See above[f]	See above[f]	0.000013	0.000050	0. 00000373	0.000001
PCB 144	68194-14-9	0.0227	See above[f]	See above[f]	0.000017	0.000050	0. 00000319	0.000001
PCB 145	74472-40-5	0.0227	See above[f]	See above[f]	0.000032	0.00010	0. 00000282	0.000001
PCB 146	51908-16-8	0.0227	See above[f]	See above[f]	0.000018	0.000050	0. 00000259	0.000001
PCB 147 + PCB 149	68194-13-8; 38380-04-0	0.0227	See above[f]	See above[f]	0.000018	0.000050	0. 000001136	0.000001

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

PCB 148	74472-41-6	0.0227	See above[f]	See above[f]	0.000032	0.00010	0. 00000360	0.000001
PCB 150	68194-08-1	0.0227	See above[f]	See above[f]	0.000033	0.00010	0. 00000286	0.000001
PCB 152	68194-09-2	0.0227	See above[f]	See above[f]	0.0000240	0.00010	0. 00000251	**0.000008**
PCB 153 + PCB 168	35065-27-1; 59291-65-5	0.0227	See above[f]	See above[f]	0.000013	0.000050	0. 000003673	0.000001
PCB 154	60145-22-4	0.0227	See above[f]	See above[f]	0.000011	0.000050	0. 00000289	0.000001
PCB 155	33979-03-2	0.0227	See above[f]	See above[f]	0.000034	0.00010	0. 00000274	0.000001
PCB 156 + PCB 157	38380-08-4; 69782-90-7	0.0227	See above[f]	See above[f]	0.000013	0.000050	0. 00000413	0.000001
PCB 158	74472-42-7	0.0227	See above[f]	See above[f]	0.000010	0.000020	0. 00000220	0.000001
PCB 159	39635-35-3	0.0227	See above[f]	See above[f]	0.000035	0.00010	0. 00000297	0.000001
PCB 160	41411-62-5	0.0227	See above[f]	See above[f]	0.000021	0.000050	0. 00000289	0.000001
PCB 161	74472-43-8	0.0227	See above[f]	See above[f]	0.000035	0.000100	0. 00000268	0.000001
PCB 162	39635-34-2	0.0227	See above[f]	See above[f]	0.000035	0.000100	0. 00000329	0.000001
PCB 164	74472-45-0	0.0227	See above[f]	See above[f]	0.000014	0.000050	0. 00000234	0.000001
PCB 165	74472-46-1	0.0227	See above[f]	See above[f]	0.000036	0.000100	0. 00000279	0.000001
PCB 167	52663-72-6	0.0227	See above[f]	See above[f]	0.000011	0.000050	0. 00000333	0.000001
PCB 169	32774-16-6	0.0227	See above[f]	See above[f]	0.000016	0.000050	0. 00000394	0.000001
PCB 170	35065-30-6	0.0227	See above[f]	See above[f]	0.000016	0.000050	0. 00000401	0.000001
PCB 171 + PCB 173	52663-71-5; 68194-16-1	0.0227	See above[f]	See above[f]	0.000037	0.00010	0. 00000399	0.000001
PCB 172	52663-74-8	0.0227	See above[f]	See above[f]	0.000038	0.00010	0. 00000407	0.000001
PCB 174	38411-25-5	0.0227	See above[f]	See above[f]	0.000039	0.00010	0. 00000333	0.000001
PCB 175	40186-70-7	0.0227	See above[f]	See above[f]	0.000039	0.00010	0. 00000411	0.000001
PCB 176	52663-65-7	0.0227	See above[f]	See above[f]	0.000039	0.00010	0. 00000291	0.000001
PCB 177	52663-70-4	0.0227	See above[f]	See above[f]	0.000014	0.000050	0. 00000391	0.000001
PCB 178	52663-67-9	0.0227	See above[f]	See above[f]	0.000022	0.000050	0. 00000337	0.000001
PCB 179	52663-64-6	0.0227	See above[f]	See above[f]	0.000023	0.000050	0. 00000240	0.000001

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

PCB 180 + PCB 193	35065-29-3; 69782-91-8	0.0227	See above[f]	See above[f]	0.000014	0.000050	0. 00000028	0.000001
PCB 181	74472-47-2	0.0227	See above[f]	See above[f]	0.000040	0.00010	0. 00000418	0.000001
PCB 182	60145-23-5	0.0227	See above[f]	See above[f]	0.000040	0.00010	0. 00000366	0.000001
PCB 183	52663-69-1	0.0227	See above[f]	See above[f]	0.000040	0.00010	0. 00000311	0.000001
PCB 184	74472-48-3	0.0227	See above[f]	See above[f]	0.000040	0.00010	0. 00000277	0.000001
PCB 185	52712-05-7	0.0227	See above[f]	See above[f]	0.000040	0.00010	0. 00000450	0.000001
PCB 186	74472-49-4	0.0227	See above[f]	See above[f]	0.000041	0.00010	0. 00000271	0.000001
PCB 187	52663-68-0	0.0227	See above[f]	See above[f]	0.000019	0.000050	0. 00000198	0.000001
PCB 188	74487-85-7	0.0227	See above[f]	See above[f]	0.000023	0.000050	0. 00000289	0.000001
PCB 189	39635-31-9	0.0227	See above[f]	See above[f]	0.000018	0.000050	0. 00000320	0.000001
PCB 190	41411-64-7	0.0227	See above[f]	See above[f]	0.000023	0.000050	0. 00000320	0.000001
PCB 191	74472-50-7	0.0227	See above[f]	See above[f]	0.000042	0.00010	0. 00000325	0.000001
PCB 192	74472-51-8	0.0227	See above[f]	See above[f]	0.000042	0.00010	0. 00000333	0.000001
PCB 194	35694-08-7	0.0227	See above[f]	See above[f]	0.000017	0.000050	0. 00000384	0.000001
PCB 195	52663-78-2	0.0227	See above[f]	See above[f]	0.000043	0.000100	0. 00000444	0.000001
PCB 196	42740-50-1	0.0227	See above[f]	See above[f]	0.000043	0.000100	0. 00000355	0.000001
PCB 197	33091-17-7	0.0227	See above[f]	See above[f]	0.000025	0.00010	0. 00000263	0.000001
PCB 198 + PCB 199	68194-17-2; 52663-75-9	0.0227	See above[f]	See above[f]	0.000020	0.000050	0. 00000359	0.000001
PCB 200	52663-73-7	0.0227	See above[f]	See above[f]	0.000025	0.00010	0. 00000309	0.000001
PCB 201	40186-71-8	0.0227	See above[f]	See above[f]	0.000044	0.00010	0. 00000294	0.000001
PCB 202	2136-99-4	0.0227	See above[f]	See above[f]	0.000044	0.00010	0. 00000329	0.000001
PCB 203	52663-76-0	0.0227	See above[f]	See above[f]	0.000044	0.00010	0. 00000327	0.000001
PCB 204	74472-52-9	0.0227	See above[f]	See above[f]	0.000045	0.00010	0. 00000297	0.000001
PCB 205	74472-53-0	0.0227	See above[f]	See above[f]	0.000045	0.00010	0. 00000401	0.000001
PCB 206	40186-72-9	0.0227	See above[f]	See above[f]	0.000045	0.00010	0. 00000795	0.000001
PCB 207	52663-79-3	0.0227	See above[f]	See above[f]	0.000045	0.00010	0. 00000594	0.000001
PCB 208	52663-77-1	0.0227	See above[f]	See above[f]	0.000046	0.00010	0. 00000687	0.000001

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

PCB 209	2051-24-3	0.0227	See above[f]	See above[f]	0.000015	0.000050	0. 00000170	0.000001

Note: Bold indicates chemicals for which the achievable laboratory limits exceed the project QL goal. Refer to Worksheet #37 for details on the data usability assessment with regard to sensitivity.

[a] DQLs based on the lower of: 1) NJDEP, 2008. New Jersey Department of Environmental Protection Soil Remediation Standards (SRSs) for residential soil (http://www.state.nj.us/dep/srp/regs/rs//) 2) USEPA RSLs for residential soil, May 2011, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). RSLs for non-carcinogenic compounds were divided by a factor of 10 to adjust for a hazard index of 0.1 to account for potential additive effects. DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or Preliminary Remediation Goals (PRGs) and are not approved by the USEPA as the appropriate risk assessment criteria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005a). "NA" indicates that the MPI QAPP did not include RLs for the associated compounds.

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods. "NA" indicates that MDL and/or QL values were not included in the validated methods.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

[e] Achievable EDLs (derived from average MB EDLs) and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual EDLs and QLs will vary based on percent moisture and other sample-specific factors. Individual congener RLs will be based on sample specific EDLs rather than QLs. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the EDLs and QLs listed in Worksheet #15. Actual co-eluters may vary from those listed in the analyte column due to changes in instrumental conditions. "NA" indicates that EDLs are not available for the associated compounds.

[f] Sediment RL from 2005 QAPP is listed as 2.00E-07 to 2.00E-06 for individual congeners PCB-1 through PCB-209. Note that the reference value of 2.00E-06 was used for comparing achievable laboratory limits to the project QL goal.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

Matrix: Sediment
Analytical Group: PCDD/PCDFs; Method 1613B; SGS - Analytical Perspectives, Wilmington, NC
Concentration Level: Low

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP[b]	Project QL Goal (mg/kg)[c, l]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	EDLs (mg/kg)	QLs (mg/kg)[l]
1,2,3,4,6,7,8-HPCDD	35822-46-9	0.00045[f]	0.0000025	0.0000025	NA	0.0000050	0.00000068	0.0000025
1,2,3,4,6,7,8-HPCDF	67562-39-4	0.00045[f]	0.0000025	0.0000025	NA	0.0000050	0.00000042	0.0000025
1,2,3,4,7,8-HxCDD	39227-28-6	0.000045[g]	0.0000025	0.0000025	NA	0.0000050	0.00000056	0.0000025
1,2,3,4,7,8-HXCDF	70648-26-9	0.000045[g]	0.0000025	0.0000025	NA	0.0000050	0.00000052	0.0000025
1,2,3,4,7,8,9-HPCDF	55673-89-7	0.00045[f]	0.0000025	0.0000025	NA	0.0000050	0.00000060	0.0000025
1,2,3,6,7,8-HxCDD	57653-85-7	0.000045[g]	0.0000025	0.0000025	NA	0.0000050	0.00000058	0.0000025
1,2,3,6,7,8-HXCDF	57117-44-9	0.000045[g]	0.0000025	0.0000025	NA	0.0000050	0.00000050	0.0000025
1,2,3,7,8,9-HxCDD	19408-74-3	0.000045[g]	0.0000025	0.0000025	NA	0.0000050	0.00000064	0.0000025
1,2,3,7,8,9-HXCDF	72918-21-9	0.000045[g]	0.0000025	0.0000025	NA	0.0000050	0.00000062	0.0000025
1,2,3,7,8-PeCDD	40321-76-4	0.0000045[h]	0.0000025	0.0000025	NA	0.0000050	0.00000044	0.0000025
1,2,3,7,8-PECDF	57117-41-6	0.00015[i]	0.0000025	0.0000025	NA	0.0000050	0.00000038	0.0000025
2,3,4,6,7,8-HXCDF	60851-34-5	0.000045[g]	0.0000025	0.0000025	NA	0.0000050	0.00000052	0.0000025
2,3,4,7,8-PECDF	57117-31-4	0.000015[j]	0.0000025	0.0000025	NA	0.0000050	0.00000036	0.0000025
2,3,7,8-TCDD	1746-01-6	0.00000012	0.00000050	0.00000012	NA	0.0000010	**0.00000030**	**0.0000010**
2,3,7,8-TCDF	51207-31-9	0.000045[g]	0.00000050	0.00000050	NA	0.0000010	0.00000024	**0.0000010**
OCDD	3268-87-9	0.015[k]	0.0000050	0.0000050	NA	0.000010	0.00000082	0.0000050
OCDF	39001-02-0	0.015[k]	0.0000050	0.0000050	NA	0.000010	0.00000068	0.0000050
Total TCDD	41903-57-5	NA	NA	0.00000050	NA	NA	NA	0.00000050
Total PeCDD	36088-22-9	NA	NA	0.0000025	NA	NA	NA	0.0000025

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

Total HxCDD	34465-46-8	NA	NA	0.0000025	NA	NA	NA	0.0000025
Total HpCDD	37871-00-4	NA	NA	0.0000025	NA	NA	NA	0.0000025
Total TCDF	55722-27-5	NA	NA	0.00000050	NA	NA	NA	0.00000050
Total PeCDF	30402-15-4	NA	NA	0.0000025	NA	NA	NA	0.0000025
Total HxCDF	55684-94-1	NA	NA	0.0000025	NA	NA	NA	0.0000025
Total HpCDF	38998-75-3	NA	NA	0.0000025	NA	NA	NA	0.0000025

Note: Bold indicates chemicals for which the achievable laboratory limits exceed the project QL goal. Refer to Worksheet #37 for details on the data usability assessment with regard to sensitivity.

[a] DQLs based on the lower of: 1) NJDEP, 2008. New Jersey Department of Environmental Protection Soil Remediation Standards (SRSs) for residential soil (http://www.state.nj.us/dep/srp/regs/rs//), 2) USEPA RSLs for residential soil, May 2011, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). RSLs for non-carcinogenic compounds were divided by a factor of 10 to adjust for a hazard index of 0.1 to account for potential additive effects. DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment criteria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005c).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods. "NA" indicates that MDL and/or QL values were not included in the validated methods.

[e] Achievable EDLs (based on laboratory averaged EDLs) and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. Actual EDLs and QLs will vary based on percent moisture and other sample-specific factors. For PCDD/PCDFs, the EDL and QL are based on extraction of 10 g/sample. The laboratory reporting detection limit will be based on the sample specific EDL. Matrix interference can increase EDLs by as much as a factor of 10x.

[f] DQL based on RSL for 2,3,7,8-TCDD divided by a TEF of 0.01 (Van den Berg, et al., 2006)

[g] DQL based on RSL for 2,3,7,8-TCDD divided by a TEF of 0.1 (Van den Berg, et al., 2006)

[h] DQL based on RSL for 2,3,7,8-TCDD divided by a TEF of 1 (Van den Berg, et al., 2006)

[i] DQL based on RSL for 2,3,7,8-TCDD divided by a TEF of 0.03 (Van den Berg, et al., 2006)

[j] DQL based on RSL for 2,3,7,8-TCDD divided by a TEF of 0.3 (Van den Berg, et al., 2006)

[k] DQL based on RSL for 2,3,7,8-TCDD divided by a TEF of 0.0003 (Van den Berg, et al., 2006)

[l] The DQL for each homolog group is equivalent to the highest QL of any congener in that homolog group.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

Matrix: Sediment
Analytical Group: Organochlorine Pesticides; SOP No. WS-ID-0014, HRGC/HRMS Method based on USEPA Method 1699 and NYSDEC HRMS-2, TestAmerica, West Sacramento, CA
Concentration Level: Low

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	EDLs (mg/kg)	QLs (mg/kg)
2,4'-Dichlordiphenyldichloroethane (DDD)	53-19-0	0.002	0.00020	0.00020	NA	NA	0.00000231	0.00004
2,4'-Dichlordiphenyldichloroethylene (DDE)	3424-82-6	0.00142	0.00020	0.00020	NA	NA	0.00000325	0.00004
2,4'-Dichlordiphenyltrichloroethane (DDT)	789-02-6	0.001	0.00020	0.00020	NA	NA	0.00000289	0.00004
4,4'-DDD	72-54-8	0.002	0.00020	0.00020	NA	NA	0.00000233	0.00004
4,4'-DDE	72-55-9	0.00142	0.00020	0.00020	NA	NA	0.00000459	0.00004
4,4'-DDT	50-29-3	0.001	0.00020	0.00020	NA	NA	0.00000336	0.00004
Aldrin	309-00-2	0.002	0.00020	0.00020	NA	NA	0.00000149	0.00004
alpha-benzene hexachloride (BHC)	319-84-6	0.00094	0.00020	0.00020	NA	NA	0.00000159	0.00004
beta-BHC	319-85-7	0.00094	0.00020	0.00020	NA	NA	0.00000207	0.00004
cis-Chlordane	5103-71-9	0.00002	0.00020	0.000020	NA	NA	0.00000245	**0.00004**
cis-Nonachlor	5103-73-1	0.2	NA	0.000020	NA	NA	0.00000292	**0.00004**
delta-BHC	319-86-8	0.00094	0.00020	0.00020	NA	NA	0.0000103	0.00004
Dieldrin	60-57-1	0.00002	0.00020	0.000020	NA	NA	0.00000242	**0.00004**
Endosulfan I	959-98-8	37	0.00020	0.000040	NA	NA	0.00000706	**0.00004**

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

Endosulfan II	33213-65-9	37	0.00020	0.000040	NA	NA	0.00000933	0.00004
Endosulfan sulfate	1031-07-8	37	0.00020	0.00020	NA	NA	0.00000114	0.00004
Endrin	72-20-8	0.00222	0.00020	0.00020	NA	NA	0.00000292	0.00004
Endrin aldehyde	7421-93-4	0.00267	0.00020	0.00020	NA	NA	0.00000481	0.00004
Endrin ketone	53494-70-5	0.00267	0.00020	0.00020	NA	NA	0.00000797	0.00004
gamma-BHC (Lindane)	58-89-9	0.00094	0.00020	0.00020	NA	NA	0.00000214	0.00004
Hexachlorobenzene	118-74-1	0.002	0.0020	0.0020	NA	NA	0.00000020	0.00004
Heptachlor	76-44-8	0.0006	0.00020	0.00020	NA	NA	0.00000111	0.00004
Heptachlor epoxide	1024-57-3	0.0006	0.00020	0.00020	NA	NA	0.00000139	0.00004
Methoxychlor	72-43-5	0.006	0.00030	0.00030	NA	NA	0.00000873	0.00004
Oxychlordane	27304-13-8	0.00002	NA	0.000020	NA	NA	0.00000242	**0.00004**
trans-Chlordane	5103-74-2	0.00002	NA	0.000020	NA	NA	0.00000231	**0.00004**
trans-Nonachlor	39765-80-5	0.00002	NA	0.000020	NA	NA	0.00000269	**0.00004**

Note: Bold indicates chemicals for which the achievable laboratory limits exceed the project QL goal. Refer to Worksheet #37 for details on the data usability assessment with regard to sensitivity.

[a] DQLs based on the lower of: 1) NJDEP, 2008. New Jersey Department of Environmental Protection Soil Remediation Standards (SRSs) for residential soil (http://www.state.nj.us/dep/srp/regs/rs//) 2) USEPA RSLs for residential soil, May 2011, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). RSLs for non-carcinogenic compounds were divided by a factor of 10 to adjust for a hazard index of 0.1 to account for potential additive effects. DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment criteria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005). "NA" indicates that the MPI QAPP did not include RLs for the associated compounds.

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods. "NA" indicates that MDL and/or QL values were not included in the validated methods.

[e] Achievable EDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual EDLs and QLs will vary based on percent moisture and other sample-specific factors. The actual reporting detection limit will be the EDL rather

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

than the QL. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the EDLs and QLs listed in Worksheet #15.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

Matrix: Sediment
Analytical Group: PAHs and Alkyl PAHs, SOP KNOX-ID-0016, based on California EPA Air Resources Board Method 429 and NOAA ORCA 130 Method, TestAmerica, Knoxville, TN
Concentration Level: Low

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
1-Methylnaphthalene	90-12-0	22	NA	0.010	NA	NA	0.0013	0.0050
1-Methylphenanthrene	832-69-9	1700	0.0033	0.0033	NA	NA	0.00026	0.0010
2,3,5-Trimethylnaphthalene	2245-38-7	3.6	0.0033	0.0033	NA	NA	0.00046	0.0020
2,6-Dimethylnaphthalene	581-42-0	3.6	0.0033	0.0033	NA	NA	0.00044	0.0020
2-Methylnaphthalene	91-57-6	0.0202	0.0033	0.0033	NA	NA	0.0029	**0.010**
Acenaphthene	83-32-9	0.00671	0.0033	0.0033	NA	NA	0.00021	0.0010
Acenaphthylene	208-96-8	0.00587	0.0033	0.0033	NA	NA	0.000063	0.0010
Anthracene	120-12-7	0.0469	0.0033	0.0033	NA	NA	0.00019	0.0010
Fluorene	86-73-7	0.019	0.0033	0.0033	NA	NA	0.00047	0.0010
Naphthalene	91-20-3	0.0346	0.0033	0.0033	NA	NA	**0.0053**	**0.020**
Phenanthrene	85-01-8	0.0419	0.0033	0.0033	NA	NA	0.0016	0.0020
Benzo[a]anthracene	56-55-3	0.0317	0.0033	0.0033	NA	NA	0.00029	0.0010
Benzo[a]pyrene	50-32-8	0.015	0.0033	0.0033	NA	NA	0.00019	0.0010
Benzo[b]fluoranthene	205-99-2	0.15	0.0033	0.0033	NA	NA	0.00025	0.0010
Benzo[e]pyrene	192-97-2	170	0.0033	0.0033	NA	NA	0.00017	0.0010
Benzo[g,h,i]perylene	191-24-2	0.17	0.0033	0.0033	NA	NA	0.00015	0.0010
Benzo[j and k]fluoranthene[f]	207-08-9	0.24	0.0033	0.0033	NA	NA	0.00022	0.0010
Chrysene	218-01-9	0.0571	0.0033	0.0033	NA	NA	0.0002	0.0010

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

Dibenzo[a,h]anthracene	53-70-3	0.00622	0.0033	0.0033	NA	NA	0.00007	0.0010
Dibenzothiophene	132-65-0	NA	0.0033	0.0033	NA	NA	0.000014	0.0010
Fluoranthene	206-44-0	0.111	0.0033	0.0033	NA	NA	0.00036	0.0010
Indeno[1,2,3-c,d]-pyrene	193-39-5	0.2	0.0033	0.0033	NA	NA	0.00017	0.0010
Perylene	198-55-0	170	0.0033	0.0033	NA	NA	0.00012	0.0010
Pyrene	129-00-0	0.053	0.0033	0.0033	NA	NA	0.0011	0.0020
C1-Benzanthracene/chrysenes	NA	NA	NA	NA	NA	NA	NA	NA
C1-Dibenzothiophenes	NA	NA	NA	NA	NA	NA	NA	NA
C1-Fluorenes	NA	NA	NA	NA	NA	NA	NA	NA
C1-Phenanthrene/anthracenes	NA	NA	NA	NA	NA	NA	NA	NA
C1-Pyrene/fluoranthenes	NA	NA	NA	NA	NA	NA	NA	NA
C2-Benzanthracene/chrysenes	NA	NA	NA	NA	NA	NA	NA	NA
C2-Dibenzothiophenes	NA	NA	NA	NA	NA	NA	NA	NA
C2-Fluorenes	NA	NA	NA	NA	NA	NA	NA	NA
C2-Naphthalenes	NA	NA	NA	NA	NA	NA	NA	NA
C2-Phenanthrene/anthracenes	NA	NA	NA	NA	NA	NA	NA	NA
C3-Benzanthracene/chrysenes	NA	NA	NA	NA	NA	NA	NA	NA
C3-Dibenzothiophenes	NA	NA	NA	NA	NA	NA	NA	NA
C3-Fluorenes	NA	NA	NA	NA	NA	NA	NA	NA
C3-Naphthalenes	NA	NA	NA	NA	NA	NA	NA	NA
C3-Phenanthrene/anthracenes	NA	NA	NA	NA	NA	NA	NA	NA
C4-Benzanthracene/chrysenes	NA	NA	NA	NA	NA	NA	NA	NA
C4-Dibenzothiophenes	NA	NA	NA	NA	NA	NA	NA	NA
C4-Naphthalenes	NA	NA	NA	NA	NA	NA	NA	NA
C4-Phenanthrenes/anthracenes	NA	NA	NA	NA	NA	NA	NA	NA

Note: Bold indicates chemicals for which the achievable laboratory limits exceed the project QL goal. Refer to Worksheet #37 for details on the data usability

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

assessment with regard to sensitivity.

[a] DQLs based on the lower of: 1) NJDEP, 2008. New Jersey Department of Environmental Protection Soil Remediation Standards (SRSs) for residential soil (http://www.state.nj.us/dep/srp/regs/rs//) 2) USEPA RSLs for residential soil, May 2011, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). RSLs for non-carcinogenic compounds were divided by a factor of 10 to adjust for a hazard index of 0.1 to account for potential additive effects. DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment criteria for this project. These values will be developed in subsequent phases of the project. "NA" indicates that the above references did not include values for the associated compounds.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005). "NA" indicates that the MPI QAPP did not include RLs for the associated compounds.

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL, with the exception of the project QL goal for 1-methylnaphthalene, which was set at two times the achievable laboratory QL. "NA" indicates that neither a DQL nor a Sediment RL was available for the associated compounds.

[d] Analytical MDLs and QLs are those documented in validated reference methods. "NA" indicates that MDL and/or QL values were not included in the validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. The actual reporting detection limit will be the adjusted QL. Detections between the QL and MDL will be reported as estimated values by the laboratory. "NA" indicates that MDLs and/or QLs are not available for the associated compounds.

[f] Benzo[j and k]fluoranthene will be reported by the laboratory with a "C" qualifier, indicating that it co-elutes with benzo[j]fluoranthene.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

Matrix: Sediment
Analytical Group: SVOCs; Method 8270C; TestAmerica, Knoxville, TN
Concentration Level: Low

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
1,1'-Biphenyl	92-52-4	80	0.0033	0.0033	NA	NA	**0.0260**	**0.17**
1,2,4,5-Tetrachlorobenzene	95-94-3	1.252	0.17	0.17	NA	NA	0.0330	0.17
1,4-Dioxane	123-91-1	4.9	0.10	0.10	NA	NA	0.0230	**0.17**
2,2'-Oxybis (1-Chloropropane)	108-60-1	NA	0.17	0.17	NA	0.66	0.0350	0.17
2,3,4,6-Tetrachlorophenol	58-90-2	180	0.17	0.17	NA	NA	0.152	**0.33**
2,4,5-Trichlorophenol	95-95-4	0.003	0.17	0.003	NA	0.66	**0.0280**	**0.17**
2,4,6-Trichlorophenol	88-06-2	0.006	0.17	0.006	NA	0.66	**0.0260**	**0.17**
2,4-Dichlorophenol	120-83-2	0.005	0.17	0.005	NA	0.66	**0.0320**	**0.17**
2,4-Dimethylphenol	105-67-9	0.304	0.17	0.17	NA	0.66	**0.260**	**0.33**
2,4-Dinitrophenol	51-28-5	0.00621	0.17	0.00621	NA	3.3	**0.330**	**0.83**
2,4-Dinitrotoluene	121-14-2	0.0144	0.17	0.0144	NA	0.66	**0.0340**	**0.17**
2,6-Dinitrotoluene	606-20-2	6.1	0.17	0.17	NA	0.66	0.0400	0.17
2-Chloronaphthalene	91-58-7	0.417	0.17	0.17	NA	0.66	0.0410	0.17
2-Chlorophenol	95-57-8	0.008	0.17	0.008	NA	0.66	**0.0340**	**0.17**
2-Methylnaphthalene[f]	91-57-6	0.0202	0.0033	0.0033	NA	0.66	**0.0330**	**0.17**
2-Methylphenol	95-48-7	310	0.17	0.17	NA	0.66	0.0370	0.17
2-Nitroaniline	88-74-4	61	0.17	0.17	NA	3.3	0.100	0.17
2-Nitrophenol	88-75-5	1830	0.17	0.17	NA	0.66	0.100	0.17
3,3',-Dichlorobenzidine	91-94-1	1.08	0.17	0.17	NA	1.3	**0.200**	**0.33**
3-Nitroaniline	99-09-2	1.83	0.33	0.33	NA	3.3	0.190	0.33
4,6-Dinitro-2-methylphenol	534-52-1	0.611	0.33	0.33	NA	3.3	0.330	0.33

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

4-Bromophenyl-phenylether	101-55-3	NA	0.17	0.17	NA	0.66	0.0470	0.17
4-Chloro-3-methylphenol	59-50-7	610	0.17	0.17	NA	1.3	0.0350	0.17
4-Chloroaniline	106-47-8	24.4	0.17	0.17	NA	1.3	0.170	0.17
4-Chlorophenyl-phenyl ether	7005-72-3	NA	0.17	0.17	NA	0.66	0.0420	0.17
4-Methylphenol	106-44-5	31	0.17	0.17	NA	0.66	0.0720	0.17
4-Nitroaniline	100-01-6	23.2	0.33	0.33	NA	NA	0.160	0.33
4-Nitrophenol	100-02-7	1800	0.17	0.17	NA	3.3	0.160	**0.33**
Acenaphthene[f]	98-86-2	0.00671	0.0033	0.0033	NA	0.66	**0.0370**	**0.17**
Acenaphthylene[f]	83-32-9	0.00587	0.0033	0.0033	NA	0.66	**0.0380**	**0.17**
Acetophenone	98-86-2	NA	0.17	0.17	NA	NA	0.0410	0.17
Anthracene[f]	120-12-7	0.0469	0.003	0.0033	NA	0.66	**0.0380**	**0.17**
Atrazine	1912-24-9	2.1	0.17	0.17	NA	NA	0.0300	0.17
Benzaldehyde	100-52-7	780	0.17	0.17	NA	NA	0.0220	0.17
Benzo(a)anthracene[f]	56-55-3	0.0317	0.0033	0.0033	NA	0.66	**0.0410**	**0.17**
Benzo(a)pyrene[f]	50-32-8	0.015	0.0033	0.0033	NA	0.66	**0.0320**	**0.17**
Benzo(b)fluoranthene[f]	205-99-2	0.15	0.0033	0.0033	NA	0.66	**0.0450**	**0.17**
Benzo(g,h,i)perylene[f]	191-24-2	0.17	0.0033	0.0033	NA	0.66	**0.0390**	**0.17**
Benzo(k)fluoranthene[f, h]	207-08-9	0.24	0.0033	0.0033	NA	0.66	**0.0500**	**0.17**
bis-(2-Chloroethoxy) methane	111-91-1	18	0.17	0.17	NA	0.66	0.0320	0.17
bis-(2-Chloroethyl)ether	111-44-4	0.21	0.17	0.17	NA	0.66	0.0420	0.17
Bis (2-Ethylhexyl)phthalate	117-81-7	0.182	0.0033	0.0033	NA	0.66	**0.0450**	**0.17**
Butylbenzylphthalate	85-68-7	0.063	0.0033	0.0033	NA	0.66	**0.0460**	**0.17**
Caprolactam	105-60-2	3100	0.17	0.17	NA	NA	0.0430	0.33
Carbazole	86-74-8	24	0.0033	0.0033	NA	NA	**0.0440**	**0.17**
Chrysene[f]	218-01-9	0.0571	0.0033	0.0033	NA	0.66	**0.0480**	**0.17**
Dibenzo(a,h)-anthracene[f]	53-70-3	0.00622	0.0033	0.0033	NA	0.66	**0.430**	**0.17**

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

Dibenzofuran	132-64-9	NA	0.17	0.17	NA	0.66	0.0410	0.17
Diethylphthalate	84-66-2	0.006	0.17	0.006	NA	0.66	**0.0400**	**0.17**
Dimethylphthalate	131-11-3	46	0.17	0.17	NA	0.66	0.0390	0.17
Di-n-butylphthalate	84-74-2	0.058	0.17	0.058	NA	NA	0.0520	0.17
Di-n-octylphthalate	117-84-0	46	0.0033	0.0033	NA	0.66	**0.0300**	**0.33**
Fluoranthene[f]	206-44-0	0.111	0.0033	0.0033	NA	0.66	**0.0500**	**0.17**
Fluorene[f]	86-73-7	0.0190	0.0033	0.0033	NA	0.66	**0.0420**	**0.17**
Hexachlorobenzene[g]	118-74-1	0.002	0.0020	0.0020	NA	0.66	**0.0350**	**0.17**
Hexachlorobutadiene	87-68-3	0.0013	0.016	0.0013	NA	0.66	**0.0350**	**0.17**
Hexachloroethane	67-72-1	0.073	0.17	0.073	NA	0.66	0.0400	**0.17**
Hexchlorocyclopentadiene	77-47-4	0.007	0.0070	0.0070	NA	0.66	**0.100**	**0.17**
Indeno(1,2,3-cd)-pyrene[f]	193-39-5	0.2	0.0033	0.0033	NA	0.66	**0.0400**	**0.17**
Isophorone	78-59-1	0.432	0.17	0.17	NA	0.66	0.0300	0.17
Naphthalene[f]	91-20-3	0.0346	0.0033	0.0033	NA	0.66	**0.0390**	**0.17**
Nitrobenzene	98-95-3	0.145	0.0033	0.0033	NA	0.66	**0.0340**	**0.17**
N-Nitroso-di-n-propylamine	621-64-7	0.069	0.070	0.069	NA	0.66	0.0360	**0.17**
N-Nitrosodiphenylamine	86-30-6	99	0.0033	0.0033	NA	0.66	**0.0360**	**0.17**
Pentachlorophenol	87-86-5	0.017	0.0033	0.0033	NA	3.30	**0.120**	**0.33**
Phenanthrene[f]	85-01-8	0.0419	0.0033	0.0033	NA	0.66	**0.0430**	**0.17**
Phenol	108-95-2	0.0491	0.17	0.17	NA	0.66	0.0390	0.17
Pyrene[f]	129-00-0	0.053	0.0033	0.0033	NA	0.66	**0.0460**	**0.17**

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

Note: Bold indicates chemicals for which the achievable laboratory limits exceed the project QL goal. Refer to Worksheet #37 for details on the data usability assessment with regard to sensitivity.

[a] DQLs based on the lower of: 1) NJDEP, 2008. New Jersey Department of Environmental Protection Soil Remediation Standards (SRSs) for residential soil (http://www.state.nj.us/dep/srp/regs/rs//) 2) USEPA RSLs for residential soil, May 2011, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). RSLs for non-carcinogenic compounds were divided by a factor of 10 to adjust for a hazard index of 0.1 to account for potential additive effects. DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment criteria for this project. These values will be developed in subsequent phases of the project. "NA" indicates that the above references did not include values for the associated compounds.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005c).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods. "NA" indicates that MDL and/or QL values were not included in the validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the MDLs and QLs listed in Worksheet #15. The reporting detection limit will be the adjusted QL. Detections between the QL and MDL will be reported as estimated values by the laboratory.

[f] Analyte will also be reported from PAH HRGC/LRMS method. The analytes 1-Methylnaphthalene, 1-Methylphenanthrene, 2,3,5-Trimethylnaphthalene, 2,6-Dimethylnaphthalene, Benzo(e)pyrene, Dibenzothiophene, and perylene, originally listed under this method, will be reported by the PAH HRGC/LRMS method only.

[g] Analyte will also be reported from pesticide analysis.

[h] Benzo[k]fluoranthene will be reported by the laboratory with a "C" qualifier, indicating that it co-elutes with benzo[j]fluoranthene.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

Matrix: Sediment
Analytical Group: TPH, NJ Method OQA-QAM-025-10/91 (for extractable TPH); TestAmerica, Burlington, VT
Concentration Level: Low

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
TPH Extractable	--	NA	20	20	10	30	1.9	20

-- No CAS Number available

[a] DQLs based on the lower of: 1) NJDEP, 2008. New Jersey Department of Environmental Protection Soil Remediation Standards (SRSs) for residential soil (http://www.state.nj.us/dep/srp/regs/rs//) 2) USEPA RSLs for residential soil, May 2011, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). RSLs for non-carcinogenic compounds were divided by a factor of 10 to adjust for a hazard index of 0.1 to account for potential additive effects. DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment criteria for this project. These values will be developed in subsequent phases of the project. "NA" indicates that the above references did not include values for the associated compounds.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005c).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the MDLs and QLs listed in Worksheet #15. The reporting detection limit will be the adjusted QL. Detections between the QL and MDL will be reported as estimated values by the laboratory.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

Matrix: Sediment
Analytical Group: Butyltins, SOP based on Krone, 1988, SOC-BUTYL, Rev. 9, ALS, Kelso, WA
Concentration Level: Low

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Dibutyltin	14488-53-0	1.8	0.0013	0.0013	NA	NA	0.00019	0.0010
Monobuyltin	78763-54-9	1.8	0.0010	0.0010	NA	NA	0.00026	0.0010
Tetrabutyltin	1461-25-2	1.8	0.0017	0.0017	NA	NA	0.00044	0.0010
Tributyltin	36643-28-4	1.8	0.0015	0.0015	NA	NA	0.00043	0.0010

[a] DQLs based on the lower of: 1) NJDEP, 2008. New Jersey Department of Environmental Protection Soil Remediation Standards (SRSs) for residential soil (http://www.state.nj.us/dep/srp/regs/rs//) 2) USEPA RSLs for residential soil, May 2011, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). RSLs for non-carcinogenic compounds were divided by a factor of 10 to adjust for a hazard index of 0.1 to account for potential additive effects. DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment criteria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005c).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods. "NA" indicates that MDL and/or QL values were not included in the validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the MDLs and QLs listed in Worksheet #15. The reporting detection limit will be the adjusted QL. Detections between the QL and MDL will be reported as estimated values by the laboratory.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

Matrix: Sediment
Analytical Group: Metals; see methods below, ALS, Kelso, WA
Concentration Level: Low

Analyte	CAS Number	Method	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
						IDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Aluminum	7429-90-5	USEPA 6010B/6020	7700	20	20	3.0	NA	0.40	2.0
Antimony	7440-36-0	USEPA 6020	2.00	1.0	1.0	NA	NA	0.020	0.050
Arsenic	7440-38-2	USEPA 6020	0.39	0.25	0.25	NA	NA	0.06	**0.50**
Barium	7440-39-3	USEPA 6020	1500	5.0	5.0	NA	NA	0.005	0.050
Beryllium	7440-41-7	USEPA 6020	16	0.25	0.25	NA	NA	0.003	0.020
Cadmium	7440-43-9	USEPA 6020	0.6	0.25	0.25	NA	NA	0.004	0.020
Calcium	7440-70-2	USEPA 6010B	NA	500	500	0.67	NA	2.0	10
Chromium (total)	7440-47-3	USEPA 6020	26	1.0	1.0	NA	NA	0.03	0.20
Cobalt	7440-48-4	USEPA 6020	2.3	0.50	0.50	NA	NA	0.0030	0.020
Copper	7440-50-8	USEPA 6020	16	1.0	1.0	NA	NA	0.08	0.10
Iron	7439-89-6	USEPA 6010B	5500	10	10	0.41	NA	0.7	4.0
Lead	7439-92-1	USEPA 6020	31	0.50	0.50	NA	NA	0.009	0.050
Magnesium	7439-95-4	USEPA 6010B	NA	500	500	2.0	NA	0.08	4.0
Manganese	7439-96-5	USEPA 6020	2660	0.50	0.50	NA	NA	0.030	0.050
Nickel	7440-02-0	USEPA 6020	16	0.50	0.50	NA	NA	0.030	0.20
Potassium	7440-09-7	USEPA 6010B	NA	500	500	Variable	NA	20	80
Selenium	7782-49-2	USEPA 6020	1.0	0.50	0.50	NA	NA	0.20	**1.0**
Silver	7440-22-4	USEPA 6020	0.5	0.25	0.25	NA	NA	0.008	0.020
Sodium		USEPA 6010B	NA	500	500	1.9	NA	4.0	40

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

	7440-23-5								
Thallium	7440-28-0	USEPA 6020	0.078	0.50	0.078	NA	NA	0.0030	0.020
Titanium	7440-32-6	USEPA 6010B	100,000[f]	100	100	0.50	NA	0.80	2.0
Vanadium	7440-62-2	USEPA 6020	38.1	0.50	0.50	NA	NA	0.02	0.20
Zinc	7440-66-6	USEPA 6020	120	1.0	1.0	NA	NA	0.20	0.50

Note: Bold indicates chemicals for which the achievable laboratory limits exceed the project QL goal. Refer to Worksheet #37 for details on the data usability assessment with regard to sensitivity.

[a] DQLs based on the lower of: 1) NJDEP, 2008. New Jersey Department of Environmental Protection Soil Remediation Standards (SRSs) for residential soil (http://www.state.nj.us/dep/srp/regs/rs//) 2) USEPA RSLs for residential soil, May 2011, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). RSLs for non-carcinogenic compounds were divided by a factor of 10 to adjust for a hazard index of 0.1 to account for potential additive effects. DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment criteria for this project. These values will be developed in subsequent phases of the project. "NA" indicates that the above references did not include values for the associated compounds.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005c).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods. Values listed are estimated instrument detection limits (IDLs) from method 6010B (assuming 100x DF for sediment matrix). Method 6020A does not list MDLs or IDLs. "NA" indicates that MDL and/or QL values were not included in the validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the MDLs and QLs listed in Worksheet #15. The MDLs and QLs shown are for the associated method referenced in the "Method" column.

[f] Value for titanium is from USEPA Region 9 PRG table (USEPA 2004).

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

Matrix: Sediment
Analytical Group: Mercury; Method 1631, Brooks Rand LLC, Seattle, WA
Concentration Level: Low

Analyte	CAS Number	Method	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
						MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Mercury, low level	7439-97-6	USEPA 1631	0.15	0.030	0.030	NA	NA	0.00015	0.00050

[a] DQLs based on the lower of: 1) NJDEP, 2008. New Jersey Department of Environmental Protection Soil Remediation Standards (SRSs) for residential soil (http://www.state.nj.us/dep/srp/regs/rs//) 2) USEPA RSLs for residential soil, May 2011, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). RSLs for non-carcinogenic compounds were divided by a factor of 10 to adjust for a hazard index of 0.1 to account for potential additive effects. DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment criteria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005c).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods. "NA" indicates that MDL and/or QL values were not included in the validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the MDLs and QLs listed in Worksheet #15. The reporting detection limit will be the adjusted QL. Detections between the QL and MDL will be reported as estimated values by the laboratory.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

Matrix: Sediment
Analytical Group: AVS/SEM USEPA Methods 821-R-91-100, 6010C/6020, ALS, Kelso, WA
Concentration Level: Low

Analyte	CAS Number	Method	DQL micro moles per gram (µmoles /g)[a]	Sediment RL from 2005 QAPP (µmoles/g)[b]	Project QL Goal (µmoles/g)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
						MDLs	Method QLs	MDLs (µmoles/g)	QLs (µmoles/g)
AVS/SEM-Acid Volatile Sulfide	18496-25-8	USEPA Method 821-R-91-100	NA	0.01	0.01	NA	NA	0.004	**0.016**
SEM-cadmium	7440-43-9	USEPA Method 821-R-91-100/ 6010C/6020	NA	1[f]	1 [f]	NA	NA	0.0002	0.0004
SEM-copper	7440-50-8	USEPA Method 821-R-91-100/ 6010C/6020	NA	1[f]	1 [f]	NA	NA	0.0008	0.002
SEM-lead	7439-92-1	USEPA Method 821-R-91-100/ 6010C/6020	NA	0.5[f]	0.5 [f]	NA	NA	0.0008	0.002
SEM-mercury	7439-97-6	USEPA Method 821-R-91-100/ 7470A	NA	0.02[f]	0.02 [f]	NA	NA	0.000005	0.00004
SEM-nickel	7440-02-0	USEPA Method 821-R-91-100/ 6010C/6020	NA	0.5[f]	0.5 [f]	NA	NA	0.0004	0.003
SEM-zinc	7440-66-6	USEPA Method 821-R-91-100/ 6010C/6020	NA	1[f]	1 [f]	NA	NA	0.0009	0.002

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

Note: Bold indicates chemicals for which the achievable laboratory limits exceed the project QL goal. Refer to Worksheet #37 for details on the data usability assessment with regard to sensitivity.

[a] DQLs based on the lower of: 1) NJDEP, 2008. New Jersey Department of Environmental Protection Soil Remediation Standards (SRSs) for residential soil (http://www.state.nj.us/dep/srp/regs/rs//) 2) USEPA Region 9 PRGs for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment criteria for this project. These values will be developed in subsequent phases of the project. "NA" indicates that the above references did not include values for the associated compounds.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005c).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods. "NA" indicates that MDL and/or QL values were not included in the validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. Actual MDLs and QLs will vary based on sample-specific factors.

[f] In extract.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

Matrix: Sediment
Analytical Group: Wet Chemistry (see methods below), ALS, Kelso, WA
Concentration Level: Low

Analyte	CAS Number	Method	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg, except as noted below)[b]	Project QL Goal (mg/kg, except as noted below)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
						MDLs	Method QLs (mg/kg)	MDLs (mg/kg, except as noted below)	QLs (mg/kg, except as noted below)
Ammonia as N	7664-41-7	USEPA 350.1	NA	0.020 mg/L[f,g] 0.20 mg/kg[g]	0.020 mg/L[f,g] 0.20 mg/kg[g]	NA	NA	0.0050 mg/L[g] 0.04 mg/kg	0.020 mg/L[g] **0.50 mg/kg**
Cyanide	57-12-5	USEPA 335.2	0.0001	2.5	0.0001	NA	NA	**0.06**	**0.20**
Total Phosphorus	14265-44-2	USEPA 365.3	NA	0.010 mg/L[f,g] 0.10 mg/kg[g]	0.010 mg/L[f,g] 0.10 mg/kg[g]	NA	NA	0.0040 mg/L[g] NA	0.010 mg/L[g] 0.10 mg/kg
TKN	7727-37-9	ASTM[h] D3590-89-02	NA	150	150	NA	NA	8.0	40
TOC	7440-44-0	Lloyd Kahn Method	NA	100	100	NA	NA	**200**	**500**
Total Sulfide	18496-25-8	SW846 9030B modified	NA	0.20	0.20	NA	0.20	0.20	**0.50**

Note: Bold indicates chemicals for which the achievable laboratory limits exceed the project QL goal. Refer to Worksheet #37 for details on the data usability assessment with regard to sensitivity.

[a] DQLs based on the lower of: 1) NJDEP, 2008. New Jersey Department of Environmental Protection Soil Remediation Standards (SRSs) for residential soil (http://www.state.nj.us/dep/srp/regs/rs//) 2) USEPA RSLs for residential soil, May 2011, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). RSLs for non-carcinogenic compounds were divided by a factor of 10 to adjust for a hazard index of 0.1 to account for potential additive effects. DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment criteria for this project. These values will be developed in subsequent phases of

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

the project. "NA" indicates that the above references did not include values for the associated compounds.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP Lower Passaic River Restoration Project, August 2005c).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods. "NA" indicates that MDL and/or QL values were not included in the validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the MDLs and QLs listed in Worksheet #15. The reporting detection limit will be the adjusted QL. Detections between the QL and MDL will be reported as estimated values by the laboratory.

[f] RLs provided in the 2005 MPI QAPP were in aqueous units (mg/L). The values were converted to solid units (mg/kg) by AECOM assuming a sample weight of 10 g.

[g] milligrams per liter.

[h] ASTM – ASTM International.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels Reference Limits and Analytical Method Evaluation Table

Matrix: Sediment
Analytical Group: Physical Testing, ASTM Methods D2974-07A (Moisture), D422 or D4464 (Grain Size), ASTM D854 (Specific Gravity), ASTM D4318 (Atterberg Limits), GeoTesting Express, Acton, MA
Concentration Level: NA

Analyte	CAS Number	DQL	Sediment RL from 2005 QAPP[b]	Project QL Goal	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs	Method QLs	MDLs	QLs
Percent Moisture	--	NA	NA	NA	NA	NA	NA	NA
Grain Size	--	NA	NA	NA	NA	NA	NA	NA
Specific Gravity	--	NA	NA	NA	NA	NA	NA	NA

-- No CAS Number available.

[a] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005c). "NA" indicates that the MPI QAPP did not include RLs for the associated compounds.

[b] Analytical MDLs and QLs are those documented in validated methods. "NA" indicates that MDL and/or QL values were not included in the validated methods.

[c] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. Actual MDLs and QLs will vary based on sample-specific factors. "NA" indicates that MDLs and QLs are not applicable to these methods.

Activities	Organization	Dates		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Project Status	de maximis, inc. / AECOM	Monthly	Monthly	Progress report	15th of each month
Planning and Development of Study Objectives	de maximis, inc. / Moffatt & Nichol / AECOM	November 2012	September 2013	QAPP	September 2013
Collection of Samples and Submission for Analysis	AECOM	September 2013	October 2013	Sample submission to laboratories	At time of collection
Laboratory Analysis	AECOM	October 2013	January 2014	Analytical data to CPG	Beginning at 30 days after collection. See Worksheet #30 for turnaround times.
Data Validation and Verification of Sediment Data; Survey Data Verification	AECOM	November 2013	February 2014	Validated data with progress report	15th of each month
Preparation and Delivery of Characterization Summary to USEPA	de maximis, inc. / AECOM	March 2014	June 2014	Draft Site Characterization Report	June 2014

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach):

The proposed sampling locations for this work are presented on Figure 1. Sampling locations were chosen to provide representative nature and extent coverage to fill spatial data needs above RM 8.

Selection was based on the following specific considerations:

- Increase data density to fill data needs above RM 8, as identified by USEPA
- Target locations where data is needed to support system understanding, sediment surface concentration mapping, and sediment transport and CFT model parameterization.

USEPA identified spatial data needs above RM 8 where additional sediment data are needed to complete the chemical nature and extent characterization for the RI and to support evaluation of remedial alternatives. The additional data will provide information on the surficial extent of COPCs as well as estimates of COPC inventory. The existing sediment data provide a general understanding of sediment COPC concentrations and distributions at depth in the sediment bed. To support the chemical nature and extent characterization data needs include sampling the sediment bed over the full depth to the native material that underlays the sediment.

The ongoing work to develop and calibrate the CFT model led to identification of additional data needs. Specifically, additional data will support the interpolation and mapping of measured surface and subsurface sediment concentrations to a continuous surface for initialization of the model grid. Locations were selected to reduce the uncertainty associated with the interpolation observed in the initial mapping results. To support the mapping and model parameterization data needs are limited to the sediment surface and upper sediment bed, however cores advanced to meet this DQO will be advanced to full depth to the native material as well.

The SSP2 locations were selected to achieve the above DQOs, and were refined based on results of a sediment probing survey performed June 3-6, 2013. The probing survey was designed to characterize the presence or absence of sediment in areas initially identified for sampling in the LRC SSP2 program. A draft field modification form proposing this work was submitted to USEPA on May 22, 2013. This field modification form modified the LRC SSP QAPP (AECOM 2012) for the performance of this probing investigation. USEPA and CPG consultants conducted a site visit on June 4, 2013 during the probing activities and modified the locations of the sediment probing survey. The results of the sediment probring survey are included in tabular format in Appendix C, along with the proposed field modification describing the probing procedures. SSP2 Sampling locations were selected where the probing survey indicated the presence of sediment.

QAPP Worksheet #18 presents the location of each proposed sample location relative to the above criteria. The target radius of an individual sampling location is 25 feet. Three attempts will made at advancing a core. If no locations within the target radius appear amenable to coring, then a surface grab sample will be collected, if possible. Additional details of station positioning are provided in SOP LPR-G-02 – Navigation/Positioning (Appendix A).

In order to address the data needs identified above, 64 locations were selected for analysis of physical and chemical analytes in grab samples and cores. The coring locations will yield a maximum of 4 samples per location and will produce a maximum of 244 samples. The surface grab locations will yield a maximum of 1 sample per location and will produce 3 samples. Combined the core and surface grab locaitons will yield a maximum of 247

QAPP Worksheet #17 (UFP-QAPP Manual Section 3.1.1) Sampling Design and Rationale

samples.

Describe the sampling design and rationale in terms of what matrices will be sampled, what analytical groups will be analyzed and at what concentration levels, the sampling locations (including QC, critical, and background samples), the number of samples to be taken, and the sampling frequency (including seasonal considerations):

The following groups of sediment analyses are proposed:

1) A comprehensive list of physical, inorganic and organic chemical analyses is proposed for the full set of stations for all sample inervals.
2) Analysis of AVS/SEM, sulfide, and selected nutrients from the surface sediment is proposed for the full set of stations.
3) Field measurements include salinity measurement of pore water from grab samples and calculation of bulk density.

The sample collection approach at 66 locations includes the combination of both sediment grabs and sediment cores. An initial sediment grab sample will be collected at each station using a grab sampler. The goal of the grab sampling is to collect sufficient sediment volume for analysis of specific target analytes (i.e., sulfides, nutrients and AVS/SEM), as well as additional volume, if needed beyond that collected by the vibracores, to meet the analytical chemistry requirements for this half-foot sample depth. A vibracore system (or piston push core) will be used to collect two to three cores at each location for chemical analysis and physical evaluation. The cores will be analyzed for the suite of physical and chemical analytes. The sample collection approach at 8locations includes the collection of sediment grab samples only. The goal of the grab sampling at these locations is to collect sufficient sediment volume for analysis of the complete suite of physical and chemical analytes. The selected locations are indicated in Figure 1.

Low Resolution Cores

One set of cores from all 66 locations (Figure 1) will be sampled using low resolution sampling intervals. Samples from the cores will be collected from the 0 to 0.5 foot surface interval (from the core and grab sample), one to two 1-foot segments (0.5 to 1.5 and 1.5 to 2.5 feet) depending on depth to native material or refusal, and a final one foot sample collected from the one foot above native material or refusal. No more than three coring attempts will be advanced at any proposed coring location. If refusal is met in these three attempts; a surface grab sample will be collected if possible. In the event that the sample volume for any sample segment is minimal the priority analyte list will be employed. Additional coring attempts and grab sample attempts beyond 3 to increase volume for a vertical segment will not be conducted.

QAPP Worksheet #17 (UFP-QAPP Manual Section 3.1.1) Sampling Design and Rationale

Samples from the coring locations will also be collected in one foot intervals and archived. These samples will be collected from the 2.5 foot interval to the top of the one foot sample interval above native material or refusal.

Under certain conditions, the segmentation scheme may be altered to adjust the sampling intervals. For example, where a stratigraphic change in the sediment sequence (e.g., change in sediment size, obvious depositional boundary or unconformity) occurs within a segment, the sampling of that segment may be altered. This will prevent different material types, with possibly different depositional ages, from being mixed together in the same sample. Segments will be reduced to less than 1-foot only where it appears that the sediment density is such that sufficient solids are present to satisfy the laboratory sample volume requirement. These adjustments, if made, will not eliminate the collection of a sample interval.

Surface Grab Samples

In addition to the 66 low resolution core locations, surface grab samples will be collected from 8 locations (Figure 1). Surface grab samples will be collected from the 0 to 0.5 foot surface interval. No more than three attempts will be made to collect a grab sample. In the event that the sample volume for the surface interval is minimal the priority analyte list will be employed. Additional grab sample events beyond 3 to increase volume for a vertical segment will not be conducted.

Station Location			Siting Rationale				NAD[4] 83 NJ State Plane Feet	
Station ID	Approximate Sediment Elevation [3] NGVD29 Feet	River Mile	CPG Location (DQO 2)	USEPA Location (DQO 1)	Core and Grab	Grab	Easting	Northing
13B-0501	-16.7	7.24	X		X		587229.01	705569.47
13B-0502	-8.9	7.23	X		X		587346.17	705520.20
13B-0503	-4.1	7.22	X		X		587418.18	705481.31
13B-0504	-6.7	7.31	X		X		587267.76	706063.35
13B-0505	-16.3	7.31	X		X		587338.68	706032.15
13B-0506	-9.7	7.31	X		X		587470.68	705977.17
13B-0507	-4.1	7.32	X		X		587580.36	705935.30
13B-0508	-16.9	8.39	X		X		589470.09	711006.03
13B-0509	-7.6	8.55		X	X		589710.63	711833.68
13B-0510	-9.2	8.71		X	X		590067.91	712576.68
13B-0511	-5.3	8.70		X	X		590281.19	712442.55
13B-0512		8.85		X	X		590447.30	713273.71
13B-0513	-2.3	8.89		X	X		590813.57	713279.87
13B-0514		8.92		X	X		590687.09	713592.77
13B-0515	-10.8	9.07		X	X		591320.97	714090.75
13B-0516	-13.5	9.22		X	X		591544.10	714850.74
13B-0517	-16.2	9.26	X		X		591730.94	715006.04
13B-0518	-17.8	9.27	X		X		591704.18	715063.72
13B-0519	-15.3	9.29	X		X		591721.04	715155.43
13B-0520	-2.8	9.37		X	X		591913.22	715559.55
13B-0521	-15.5	9.37	X		X		591961.04	715524.93
13B-0522	-3.0	9.50		X		X	592438.91	716094.97
13B-0523	-1.9	9.57		X	X		592158.36	716458.16

QAPP Worksheet #18 (UFP-QAPP Manual Section 3.1.1) Sampling Locations and Methods/SOP Requirements Table [1,2]

13B-0524	-3.4	9.73		X	X		592168.77	717305.39
13B-0525	-1.9	9.86		X	X		592009.05	717904.35
13B-0526	-11.3	9.98	X		X		591832.86	718615.63
13B-0527	-2.8	9.99		X	X		592051.74	718532.63
13B-0528	-8.0	10.04	X		X		592098.48	718842.18
13B-0529	-11.5	10.06	X		X		591979.68	718954.72
13B-0530	-11.6	10.06	X		X		592055.38	718937.70
13B-0531	-12.1	10.08	X		X		592006.62	719056.12
13B-0532	-11.8	10.08	X		X		592074.75	719032.36
13B-0533	-7.9	10.08	X		X		592152.96	719010.82
13B-0534	-1.3	10.07		X	X		592224.52	718985.65
13B-0535	-12.8	10.15		X	X		592034.53	719433.26
13B-0536	-3.2	10.22		X	X		592276.24	719787.33
13B-0537	-15.6	10.30	X		X		592191.04	720197.95
13B-0538	-11.1	10.30		X	X		592281.29	720194.58
13B-0539	-3.6	10.45		X	X		592054.50	721023.97
13B-0540	-3.7	10.46		X	X		592314.61	721027.61
13B-0541	-8.2	10.83		X	X		592541.13	723057.93
13B-0542	-1.5	11.02		X	X		593416.98	723646.48
13B-0543	-0.3	11.19		X	X		594333.78	723898.32
13B-0544	-10.9	11.23		X	X		594541.94	723859.33

QAPP Worksheet #18 (UFP-QAPP Manual Section 3.1.1) Sampling Locations and Methods/SOP Requirements Table [1,2]

13B-0545	-7.4	11.26		X	X		594679.14	723932.19
13B-0546	-14.2	11.27		X		X	594798.35	723769.45
13B-0547	-7.8	11.31		X	X		595022.35	723809.15
13B-0548	-1.0	11.46		X	X		595612.11	724359.22
13B-0549		11.67		X	X		596219.98	725163.59
13B-0550	-2.7	11.71		X	X		596539.88	725265.49
13B-0551		11.77		X	X		596622.50	725595.96
13B-0552	-12.4	12.15		X	X		596918.30	727595.79
13B-0553	-2.9	12.32		X	X		596873.64	728435.94
13B-0554	-3.9	12.33		X	X		597078.01	728535.75
13B-0555	-10.6	12.45		X	X		596637.33	729035.41
13B-0556	-4.0	12.69		X	X		596311.33	730306.34
13B-0557	-11.2	12.85		X	X		596085.44	731135.25
13B-0558	-12.2	12.94		X	X		596314.34	731561.59
13B-0559	-11.4	13.15		X	X		596746.94	732535.76
13B-0560	-11.2	13.47		X	X		597077.11	734180.04
13B-0561	-2.3	13.73		X	X		597557.14	735464.95
13B-0562	-10.8	13.79		X		X	597455.23	735789.76
13B-0563		14.44	X		X		598517.79	738365.36
13B-0564		14.56	X		X		599074.94	738101.40
13B-0565	-4.86	8.26		X		X	589562.07	710292.03

QAPP Worksheet #18 (UFP-QAPP Manual Section 3.1.1) Sampling Locations and Methods/SOP Requirements Table [1,2]

13B-0566	-9.53	8.29		X	X		589328.00	710444.37
13B-0567	-3.16	9.33		X		X	591978.32	715280.59
13B-0568	-9.18	9.85		X		X	591773.53	717821.81
13B-0569	-5.15	11.91		X		X	596782.25	726324.50
13B-0570	-8.63	12.15		X		X	597063.53	727573.39
13B-0571	-2.43	12.82		X	X		596242.19	730886.88
13B-0572	-6.71	12.99		X	X		596609.16	731698.00
13B-0573	-12.39	13.26		X	X		596727.50	733140.21
13B-0574	-1.86	13.48		X	X		597006.34	734274.33

QAPP Worksheet #18 (UFP-QAPP Manual Section 3.1.1) Sampling Locations and Methods/SOP Requirements Table [1,2]

Notes:

[1] Samples from all locations will be analyzed for the base analyte list. Refer to complete list of analytes in Worksheet #14.

[2] The LRC SSP2 sediment cores will be collected from the 0 to 0.5 foot surface interval (from the core and grab sample), one to two 1-foot segments (0.5 to 1.5 and 1.5 to 2.5 feet) depending on depth to native material or refusal, and a final composite sample from 2.5 feet to native material or refusal. No more than three coring attempts will be advanced at any proposed coring location. If refusal is met in these three attempts; a surface grab sample will be collected if possible. In the event that the sample volume for any sample segment is minimal the priority analyte list will be employed. Additional coring attempts or surface grab sample attempts beyond 3 to increase volume for a vertical segment will not be conducted. In addition to the grab and core sample locations, surface grab samples will be collected at 3 locations (Figure 1). The surface grab samples will sample for the 0 to 0.5 foot surface interval. No more than three surface grab sample attempts will be performed at any proposed location. In the event that the sample volume for any surface segment is minimal the priority analyte list will be employed. Additional surface grab sample attempts beyond 3 to increase volume will not be conducted.

[3] Water depths estimated from
- [a] 2010 GBA bathymetry survey
- [b] 2007 GBA bathymetry survey
- [c] NOAA Navigation Chart 12327

Blank value indicates bathymetric data is not available

[4] North American Datum (NAD)

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[a]	Sample Size[b]	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time[c] (preparation/ analysis)
Sediment	SVOCs	Low	TA-3, TA-4	125 g minimum	8 ounce (oz) wide-mouth glass jar (amber preferred)	0-6°C; store in the dark	14 calendar days to preparation[e]; 40 calendar days from preparation to analysis
Sediment	PAHs/alkyl PAHs	Low	TA-7, TA-8	45 g minimum	8 oz wide mouth glass jar (amber preferred)	During shipment: 0-6°C; store in the dark Upon arrival at lab: store at <-10°C in the dark [g]	14 calendar days to preparation[e,f]; 40 calendar days from preparation to analysis
Sediment	Organochlorine Pesticides	Low	TA-10, TA-11	40 g minimum	4 oz wide mouth glass jar (amber preferred)	During shipment: 0-6°C; store in the dark; upon arrival at lab: store at <-10°C in the dark [g]	365 calendar days for preparation and analysis
Sediment	PCBs (Homologs and Congeners)	Low	AP-3	45 g minimum	8 oz wide mouth glass (amber preferred)	During shipment: 0-6°C; store in the dark; upon arrival at lab: store at <-10°C in the dark [g]	365 calendar days for preparation and analysis
Sediment	TPH-Extractables	Low	TA-1	100 g	8 oz wide mouth glass (amber preferred)	0-6°C; store in the dark	14 calendar days to preparation; 40 calendar days from preparation to analysis
Sediment	PCDD/PCDFs	Low	AP-1	20 g	4 oz wide mouth glass (amber preferred)	During shipment: 0-6°C; store in the dark; upon arrival at lab: store at <-10°C in the dark [g]	365 calendar days for preparation and analysis

QAPP Worksheet #19 (UFP-QAPP Manual Section 3.1.1) Analytical SOP Requirements Table

Sediment	Metals	Low	C-4, C-5, C-6	20 g	8 oz wide mouth glass	0-6°C	180 calendar days (6 months) for preparation and analysis **EXCEPT** mercury
Sediment	Low Level Mercury	Low	BR-1	20 g	2 oz wide mouth glass	0-6°C during shipment; ≤ -15°C in lab	28 calendar days to analysis
Sediment	Butyltin	Low	C-1, C-2	20 g	8 oz wide mouth glass	0-6°C	14 calendar days to preparation; 40 calendar days from preparation to analysis
Sediment	AVS/SEM	Low	C-15, C-5, C-19	20 g	2 oz wide mouth glass	0-6°C, minimize headspace	AVS: evolution within 14 calendar days; analysis within 24 hours of evolution. SEM: analysis within 14 calendar days of extraction
Sediment	Ammonia	Low	C-17	20 g	8 oz wide mouth glass	0-6°C	7 calendar days to extraction; extracts preserved by lab with 9N sulfuric acid; 28 calendar days from extraction to analysis
Sediment	Cyanide	Low	C-10	20 g	8 oz wide mouth glass	0-6°C	14 calendar days to analysis.
Sediment	TKN	Low	C-16	20 g	8 oz wide mouth glass	0-6°C	None established for soils/sediments
Sediment	Total Phosphorus	Low	C-18	20 g	8 oz wide mouth glass	0-6°C	28 calendar days to analysis

QAPP Worksheet #19 (UFP-QAPP Manual Section 3.1.1) Analytical SOP Requirements Table

Sediment	TOC	Low	C-13	20 g	8 oz wide mouth glass	0-6°C	14 calendar days to analysis
Sediment	Total Sulfide	Low-High	C-11	20 g	2 oz wide mouth glass	Fill jar completely with sediment. Pour 10 mL NaOH/Zinc Acetate solution over the top of the sample. Ship on ice 0-6°C	7 calendar days to analysis
Sediment	Percent Moisture	N/A	AP-2, BR-2, C-14, TA-2, TA-9, TA-12, GT-1, GL-3		Included in above	0-6°C	None established
Sediment	Grain Size	N/A	GT-2	250 g[d]	16 oz wide mouth glass	0-6°C	None established
Sediment	Specific Gravity	N/A	GT-3	See footnote d	Included in above	0-6°C	None established

[a] Refer to Worksheet #23 for SOP titles.

[b] Sample size is the minimum requested by each laboratory to perform the requested analysis; minimum sample size requirements reflect the additional sample needed to permit the laboratory to obtain a dry aliquot of sufficient size to reach project QL goals assuming samples may contain up to 50% moisture. Additional sample volume is need for field QC samples (e.g., MSs).

[c] Begins at time of collection of core or grab.

[d] 250 g includes sufficient sample to perform Grain Size and Specific Gravity.

[e] Samples will be frozen at the laboratory (< -10°C) after aliquot is removed for extraction.

[f] The holding time for frozen samples is extended to 100 days per MPI QAPP modification (January 2007c).

[g] Samples will be stored frozen (< -10°C) and in the dark after receipt and log-in at the laboratory. When samples are scheduled for extraction, they will be removed from the freezer and allowed to thaw at room temperature until at a consistency where the sample can be mixed and a representative aliquot taken for analysis. The time samples are removed from the freezer and the time the remaining sample is returned to storage will be recorded; extraction will begin within 8 hours of the time samples are removed from the freezer.

QAPP Worksheet #20 (UFP-QAPP Manual Section 3.1.1) Field Quality Control Sample Summary Table

Matrix	Analytical Group	Conc. Level	Analytical and Preparation SOP Reference [a]	No. of Sampling Locations (No. of Samples)[b]	No. of Field Duplicates[c]	No. of Rinsate Blanks [d]	No. of PE Samples[e]	Total No. of Samples to Lab
Sediment	Semivolatile Organics	Low	TA-3, TA-4	74 (272)	15	20	0	306
Sediment	PAHs/alkyl PAHs	Low	TA-7, TA-8	74 (272)	14	20	14	320
Sediment	Organochlorine Pesticides	Low	TA-10, TA-11	74 (272)	14	20	14	320
Sediment	PCBs (Homologs and Congeners)	Low	AP-3	74 (272)	14	20	14	320
Sediment	TPH Extractables	Low	TA-1	74 (272)	14	20	0	306
Sediment	PCDD/PCDFs	Low	AP-1	74 (272)	14	20	14	320
Sediment	TAL Metals, Titanium	Low	C-4, C-5, C-6	74 (272)	14	20	0	306
Sediment	Low Level Mercury	Low-High	BR-1	74 (272)	14	20	0	306
Sediment	Butyltins	Low	C-1, C-2	74 (272)	14	20	0	306
Sediment	AVS/SEM	Low	C-15, C-5, C-19	74 (74)	4	12	0	90
Sediment	Ammonia	Low	C-17	74 (74)	4	12	0	90
Sediment	Cyanide	Low	C-10	74 (272)	14	20	0	306
Sediment	TKN	Low	C-16	74 (74)	4	12	0	90
Sediment	Phosphorus	Low	C-18	74 (74)	4	12	0	90
Sediment	TOC	Low	C-13	74 (272)	14	20	0	306
Sediment	Total Sulfide	Low-High	C-11	74 (74)	4	12	0	90
Sediment	Grain Size	N/A	GT-2	74 (272)	14	NA	0	286
Sediment	Specific Gravity	N/A	GT-3	74 (272)	14	NA	0	286

QAPP Worksheet #20 (UFP-QAPP Manual Section 3.1.1) Field Quality Control Sample Summary Table

Sediment	Percent Moisture	High	AP-2, BR-2, C-14, TA-2, TA-9, TA-12, GT-1	74 (272)	14	NA	0	286

QAPP Worksheet #20 (UFP-QAPP Manual Section 3.1.1) Field Quality Control Sample Summary Table

[a] Refer to Worksheet #23 for SOP title

[b] The estimated number of samples was based on the following assumptions:

[c] A surface grab sample and core(s) will be taken at 66 locations. Samples will be collected from the grab (0 to 0.5 ft) and from core intervals 0.0 to 0.5 ft, 0.5 to 1.5 ft and 1.5 to 2.5 ft and a final one foot sample collected from the one foot above native material or refusal. Only a surface grab sample will be collected from an additional 8 locations.

Field duplicates will be collected at a frequency of 1 per 20 samples unless noted otherwise. Field duplicates will be collected by homogenizing the sediment collected from the core interval and then distributing the sample material between two sets of containers, each uniquely identified. The parent sample and the field duplicate will be submitted to the laboratory, analyzed, and reported as separate samples.

[d] Equipment rinsate blanks will be collected at a frequency of one per week per sampling team for each set of decontaminated equipment utilized for a particular task (for example, grab sampling, core collection, and sample processing in the facility). One equipment rinsate blank per task was assumed, based on a 4-week field program with two sampling vessels.

[e] Since it is anticipated that LRC SSP2 program will not occur within six months of the the previous sediment sampling program, a pre-program PE study limited to the primary laboratories performing analysis for PCDD/PCDFs, PCBs (homologs and congeners), PAHs and organochlorine pesticideswill be performed prior to the LRC SSP2 program. The results of this pre-program PE study are included as Appendix D. In addition,known PE Samples obtained from a commercial vendor (e.g., Resource Technology Corporation [RTC] or Wibby Environmental), which are not blind, will be inserted with sample shipments at a rate of 1 per 20 samples for PCDD/PCDFs, PCBs (homologs and congeners), PAHs, and organochlorine pesticides analyses. Note that these samples should not be confused with standard reference material (SRM) or CRM samples which are analyzed at laboratories as part of their method or on-going QC programs.

The following is a list of all SOPs associated with project sampling including, but not limited to, sample collection, sample preservation, equipment cleaning and decontamination, equipment testing, inspection and maintenance, supply inspection and acceptance, and sample handling and custody.

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
LPR-G-01	Field Records	AECOM	NA	No	Appendix A
LPR-G-02	Navigation/Positioning	AECOM	Differential Global Positioning System (GPS)	Yes (see below)	Appendix A
LPR-G-03	Equipment decontamination	AECOM	Various – see Appendix B	No	Appendix A
LPR-G-04	IDW handling and disposal	AECOM	Various – see Appendix B	No	Appendix A
LPR-G-05	Sample custody	AECOM	NA	No	Appendix A
LPR-G-06	Packaging and shipping	AECOM	NA	No	Appendix A
LPR-S-01	Sediment grab sampling	AECOM	Grab sampler, box corer	No	Appendix A
LPR-S-02	Sediment coring using a piston push core	AECOM	Piston corer	No	Appendix A
LPR-S-03	Sediment coring using a vibracorer	AECOM	Vibracorer	Yes (see below)	Appendix A
LPR-S-04	Sediment core processing	AECOM	NA	No	Appendix A
LPR-FI-07	HOBO Water Level Data Logger Data Collection	AECOM	HOBO	No	Appendix A
SOP-8	Procedure for sediment probing	MPI	Steel rod	Yes (see below)	Appendix A

LPR-G-02 is modified by this worksheet for this task as follows: “In order to establish the elevation of the sediment surface at locations within the river, a system will be established whereby the water level of the river is continuously monitored and recorded for use as a local reference. This system will consist of a number of transducer/data loggers (tide gauges) for measuring and recording the water level located on available bridges and as previously located during the LRC sampling program.”

LPR-S-03 (Section 5.0) is modified by this worksheet for this task as follows: the definition of acceptable recovery (Section 5.1.4 through Section 5.1.6) is amended to 80% or greater than the depth of penetration.

SOP-8 – Section III. 1 is modified by this worksheet as follows: “Using the on-board GPS system, maneuver the sampling vessel to the pre-programmed target coordinates for each core sample location and stabilize the vessel as much as possible.”

Procedural modifications to these documents may be warranted depending upon field conditions, equipment limitations, or limitations imposed by the procedure. Substantive modification will be approved in advance by the Project QA Manager and Task Manager and communicated to the CPG Coordinator and to the USEPA RPM. Deviations will be documented in the field records.

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
PID	Initial: Each time the instrument is turned on, or if the instrument gives erratic results. Check: Every 15 samples and at the end of the day. 100 ppm isobutylene standard	Refer to SOP.	Refer to SOP.	Refer to SOP.	Refer to SOP.	Within 10% for calibration.	Recalibrated or replaced.	AECOM FTM or designee.	7315[2]
Mercury Vapor Analyzer Jerome 431-X	Initial: Zero the instrument each time it is turned on, or if the instrument gives erratic results. Check: Every 15 samples and at the end of the day.	Regenerate the sensor at the beginning and end of each day, if the sensor becomes saturated, or if instrument gives erratic results, prior to zeroing. Replace 0.25 mm fritware weekly, per Section 5.2 of manual.	Zero the instrument per manufacturer's specifications (Section 4.2 of the manual, provided with equipment).	Daily for functionality. Inspect end of probe at beginning of the day and periodically throughout the day to ensure cleanliness. Rinse probe with DI and air dry at the end of each day.	Daily or as needed.	Initial reading following regeneration <0.005.	Clean intake. Recalibrated or replaced.	AECOM FTM or designee.	HASP[2]

QAPP Worksheet #22 (UFP-QAPP Manual Section 3.1.2.4) Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Hydrogen Sulfide Meter MultiRAE Plus	Initial: Each time the instrument is turned on, or if the instrument gives erratic results. Check: Every 15 samples and at the end of the day. 25 ppm H_2S, 50 ppm CO, 20.9% Oxygen, 50% LEL methane.	Battery checks performed every morning before use, and charged every evening after use. Probe will be kept clean of debris.	Calibrate the instrument per manufacturer's specifications (pages 4-8 of the manual, provided with equipment).	Daily for functionality.	Daily or as needed.	Within 10% for calibration.	Recalibrated or replaced.	AECOM FTM or designee.	HASP[2].
Salinity Refractometer Vee Gee STX-3	Periodically per manufacturer's specifications.	Clean prism after each measurement using tissue paper and water. If prism is coated with oily solution it may be cleaned with a weakened detergent or similar solvent.	Calibrate with distilled water per manufacturer's specifications.	Inspect prism to check that sample covers entire prism and there are no bubbles.	Calibration as needed. inspection during each sample. Maintenance after each sample.	Reading less than one subdivision from zero for calibration. Sample solution spread thin and evenly over prism for each measurement.	Re-calibrate in controlled environment if acceptance criteria are not met. If there are bubbles or gaps across the prism, re-apply sample solution.	AECOM FTM or designee.	See Manufacturer's Specifications
Package Scale Dymo S-100 or Equivalent	Per manufacturer's specifications.	Per manufacturer's specifications.	Per manufacturer's specifications.	Per manufacturer's specifications.	Per manufacturer's specifications.	Per manufacturer's specifications.	Per manufacturer's specifications.	AECOM FTM or designee.	NA

QAPP Worksheet #22 (UFP-QAPP Manual Section 3.1.2.4) Field Equipment Calibration, Maintenance, Testing, and Inspection Table

[1]Refer to the Project Sampling SOP References table (Worksheet #21).
[2] Data used for H&S monitoring only.

Reference Number[b,d]	Primary Method Reference[b]	Laboratory SOP Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
TA-4	EPA 8270C	GC/MS Analysis Based on Method 8270C, KNOX-MS-0016, Rev. 11, 7/12/11	Definitive	Organics (SVOCs)	Gas Chromatograph/ Mass Spectrometer (GC/MS)	TestAmerica-Knoxville, TN	Y, Sonication prep option (in SOP TA-3) with increased aliquot size to achieve project DQLs
TA-3	EPA 3500 and 3600 Methods	Extraction and Cleanup of Organic Compounds from Waters, Soils, Solids, Sediments, Tissue, and Wastes Based on SW-846 3500 and 3600 Methods, KNOX-OP-0011, Rev. 14, 2/27/13	Definitive	Organics (Sample Preparation)	N/A	TestAmerica-Knoxville, TN	N
TA-7	NOAA 130	Extraction of Selected Semivolatile Organic Compounds and Alkylated PAHs for Analysis by GC/MS-SIM, KNOX OP-0023, Rev.2, 2/28/2013	Definitive	Organics (Sample Preparation)	N/A	TestAmerica-Knoxville, TN	Minimum aliquot size permitted is 1 g
TA-8	NOAA 130, California EPA Air Resources Board Method 429	Isotope Dilution Analysis of Selected Semivolatile Organic Compounds and Alkylated PAHs by Gas Chromatography/Mass Spectrometry-Selected Ion Monitoring (GC/MS-SIM), KNOX-ID-0016, Rev.9, 11/14/2012	Definitive	Organics (PAHs)	GC/MS-SIM	TestAmerica-Knoxville, TN	Y, Cleanup by gel permeation chromatography (GPC) and silica gel
AP-3	EPA 1668A	Standard Operating Procedure for the Analysis of Polychlorinated Biphenyls (PCBs), HRMS PCBs, DC_367, Rev. 2, 6/17/2013	Definitive	Organics (PCB Congeners)	HRGC/HRMS	SGS - Analytical Perspectives, Wilmington, NC	Minimum aliquot size permitted is 1 g; Toluene Soxhlet /Dean Stark (SDS) extraction option is specified
TA-10	EPA 3640A	Gel-Permeation Cleanup, WS-OP-0012, Rev. 4.2, 3/5/2011	Definitive	Organics (Pesticides)	N/A	TestAmerica, West Sacramento, CA	N
TA-11	EPA 1699, NYSDEC HRMS-2	Analysis of Organochlorine Pesticides by High Resolution Gas Chromatography/High Resolution Mass Spectrometry, WS-ID-0014, Rev. 5.6, 2/10/2012	Definitive	Organics (Pesticides)	HRGC/HRMS	Test America West Sacramento, CA	Minimum aliquot size permitted is 1 g; Toluene/SDS extraction option is specified

QAPP Worksheet #23 (UFP-QAPP Manual Section 3.2.1) Analytical SOP References Table[a]

TA-12	ASTM D2216	Determination of Percent Moisture [ASTM D2216], SOP No. WS-OP-0013, Rev. 4.2, 03/29/2013	Definitive	General Chemistry	Analytical Balance	TestAmerica West Sacramento, CA	N
C-4	EPA 3050	Metals Digestion, MET-3050, Rev. 12, 1/25/2012	Definitive	Metals (Sample Preparation-sediment)	N/A	ALS-Kelso, WA	N
C-5	EPA 6010C	Determination of Metals and Trace Elements by Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP), MET-ICP, Rev. 23, 9/28/2011	Definitive	Metals, SEM Metals (except SEM mercury)	ICP/AES	ALS-Kelso, WA	N
C-6	EPA 6020A	Determination of Metals and Trace Elements by Inductively Coupled Plasma-Mass Spectrometry, EPA Method 6020, MET-6020, Rev. 14, 3/19/2010	Definitive	Metals	ICP/MS	ALS-Kelso, WA	N
C-1	Krone[d]	Extraction of Organotins in Sediment, Water and Tissue Matrices, EXT-OSWT, Rev. 6, 11/10/2009	Definitive	Organics (Sample Preparation)	N/A	ALS-Kelso, WA	N
C-2	Krone[d]	Butyltins, SOC-BUTYL, Rev. 11, 12/22/11	Definitive	Organics (Butyltin)	GC/Flame Photoionization Detector (FPD)	ALS-Kelso, WA	N
C-15	EPA-821-r-91-100 (12/91)	Sulfides, Acid Volatile, GEN-AVS, Rev.6, 1/6/12	Definitive	AVS	Ultraviolet-Visible Spectroscopy (UV-VIS)	ALS-Kelso, WA	N

QAPP Worksheet #23 (UFP-QAPP Manual Section 3.2.1) Analytical SOP References Table[a]

C-17	EPA 350. 1	Ammonia by Flow Injection Analysis, GEN-350.1, Rev.9, 1/18/12	Definitive	General Chemistry	Rapid Flow Analyzer Colorimeter	ALS-Kelso, WA	Y, modified to include sulfide cleanup procedures in Nitrogen, ammonia, colorimetry, salicylate-hypochlorite, automated-segmented flow, USGS I-6522-90
C-10	EPA 335.2	Total Cyanides and Cyanides Amenable to Chlorination, GEN-CN, Rev. 17, 1/4/2012	Definitive	General Chemistry	Rapid Flow Analyzer Colorimeter	ALS/Kelso, WA	N
C-18	EPA 365. 3	Phosphorus Determination Using Colorimetric Procedure, GEN-365.3, Rev. 11, 10/13/2011 (Includes sample preparation)	Definitive	General Chemistry	UV-VIS	ALS-Kelso, WA	N
C-16	ASTM D3590-89A, ASTM D1426-93B	Nitrogen, Total and Soluble Kjeldahl, GEN-TKN, Rev. 12, 2/17/2011 (Includes sample preparation)	Definitive	General Chemistry	Ion Selective Electrode	ALS-Kelso, WA	N
C-13	Lloyd Kahn Method	Carbon, Total Organic in Soil, GEN-ASTM, Rev.7, 8/8/2011	Definitive	General Chemistry	Induction Furnace	ALS -Kelso, WA	N
C-11	EPA 9030B	Total Sulfides by Methylene Blue Determination, GEN-9030, Rev. 10, 12/21/09 (Includes sample preparation)	Definitive	General Chemistry	UV-VIS	ALS-Kelso, WA	N
C-19	EPA 7470A	Mercury in Liquid Waste; MET-7470A, Rev. 14, 9/16/2009	Definitive	SEM Mercury	Atomic Absorption Spectrometer	ALS-Kelso, WA	N

QAPP Worksheet #23 (UFP-QAPP Manual Section 3.2.1) Analytical SOP References Table[a]

GT-1	ASTM D 2216	Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock Mass, Rev.67/2011	Definitive	General Chemistry	Analytical Balance	GeoTesting Express, Acton, MA	N
GT-2	ASTM D 422	Test Method for Particle Size Analysis of Soils, Rev. 7, 9/2010	Definitive	Physical Testing	WS Tyler-RX Sieve Shaker, Sieves	GeoTesting Express – Acton, MA	Y, sieve sizes will conform to those specified in the memo dated March 28, 2008 from Leonard Warner/MPI to Tom Taccone/ EPA, entitled "Core Top" Modeling and Risk Assessment Data Needs, Lower Passaic River Restoration Project. This memo is included in Appendix B-1 (as MPI 2008 "Core Top" Memo). Hydrometer for finer fractions will be utilized.
GT-3	ASTM D 854	Standard Test Method for Specific Gravity of Soil Solids by Water Pycnometer, Rev.6, 7/2011	Definitive	Physical Testing	Pycnometer	GeoTesting Express – Acton, MA	N
AP-1	EPA 1613B	Polychlorinated Dibenzo Dioxin/Furans, DC_364, Rev. 1, 11/12/2012	Definitive	Organics (PCDD/PCDFs)	HRGC/HRMS	SGS-Analytical Perspectives, Wilmington, NC	Toluene/SDS extraction option specified

QAPP Worksheet #23 (UFP-QAPP Manual Section 3.2.1) Analytical SOP References Table[a]

AP-2	EPA 160.3	Percent Solids Determination, AP-SP-C2, Rev. 6, 10/8/2010	Definitive	General Chemistry	Analytical Balance	SGS - Analytical Perspectives, Wilmington, NC	N
BR-1	EPA 1631	BRL Procedure for EPA Method 1631, Total Mercury in Tissue, Sludge, Sediment, and Soil by Acid Digestion and Bromide Chloride (BrCl) Oxidation by Cold Vapor Atomic Fluorescence Spectrometry (CVAFS), BR-0002, Rev. 010e, 11/1/2012	Definitive	Metals (Total and Low Level Mercury)	CVAFS	Brooks Rand-Seattle, WA	N
C-14	EPA 160.3	Total Solids, GEN-160.3, Rev. 11, 4/10/2007	Definitive	General Chemistry	Analytical Balance	ALS -Kelso, WA	N
TA-9	EPA 160.3	Percent Moisture, KNOX-WC-0012, Rev. 8, 11/3/09	Definitive	General Chemistry	Analytical Balance	TestAmerica Knoxville, TN	N
BR-2	EPA 160.3 SM2540G	Dry Weight Determination, BR-1501, Rev.6, 5/31/12	Definitive	General Chemistry	Analytical Balance	Brooks Rand-Seattle, WA	N
TA-1	New Jersey OQA-QAM-025-02/08	Quantitation of Semi-Volatile Petroleum Products by GC/FID (New Jersey OQA-QAM-025-02/08), BR-GC-009, Rev. 1, 9/10/2008; SOP Change-In-Process Attachment, Quantitation of SVOA Petroleum Products by GC/FID (CIPA-BR-GC-009_09.25.08)	Definitive	Organics (TPH)	GC/FID	TestAmerica–Burlington, VT	N
TA-2	USEPA CLP SOW	Percent Moisture Determination, BR-WC-006, Rev. 6, 10/29/2010	Definitive	General Chemistry	Analytical Balance	TestAmerica–Burlington, VT	N

QAPP Worksheet #23 (UFP-QAPP Manual Section 3.2.1) Analytical SOP References Table[a]

[a] All SOPs are contained in Appendix B.

[b] It is expected that the procedures outlined in these SOPs will be followed. Procedural modifications to individual SOPs may be warranted depending upon an individual sample matrix, interferences encountered, or limitations imposed by the procedure. Deviations from individual SOPs will be documented in the laboratory records. Substantive modification to any SOP will be approved in advance by the AECOM Project QA Manager and AECOM Task Manager and communicated to the CPG Coordinator and to the USEPA Remedial Project Manager. The ultimate procedure employed will be documented in the report summarizing the results of the sampling event or field activity.

[c] Krone, C. A. *et al* 1988.

[d] The reference numbers presented in this worksheet use a numbering system that is consistent between the current sediment characterization programs (i.e., RM 10.9, LRC SSP). However, only the reference numbers and associated SOPs for the LRC SSP2 are presented in this Worksheet #23.

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference[a]
GC/MS (SVOC)	Decafluorotriphenyl phosphine (DFTPP) tune; Initial and Continuing Calibration as required in SOP	Verify tune every 12 hours; Initial calibration after instrument set up, after major instrument changes and when continuing calibration criteria are not met	Initial Calibration (ICAL) %Relative Standard Deviation (RSD) ≤ 30% for calibration check compounds (CCCs); ICAL %RSD ≤ 15% or linear curve r ≥ 0.995, or quadratic curve $r^2 \geq 0.990$. Continuing calibration verification (CCV) %D ≤ 20% for CCCs; system performance check compounds (SPCC) minimum avg. Response Factor (RF)	Inspect system, correct problem, rerun calibration and affected samples	Analyst	TA-4
HRGC/LRMS-SIM (PAH)	Tune the mass spectrometer as needed using perfluorotributylamine (PFTBA) and the instrument data system autotune program. Select the DFTPP tune optimization profile for the autotune program	Verify tune every 12 hours; Initial calibration after instrument set up, after major maintenance, and/or instrument changes have occurred	ICAL %RSD ≤ 30% CCV %D ≤ 30%.	Inspect system, correct problem, rerun calibration and affected samples	Analyst	TA-8
HRGC/HRMS (Pesticides)	Instrument tuning, initial and continuing calibration as required in SOP	Initial calibration after instrument set up, after major maintenance and/or instrument changes have occurred. Calibration verification minimum every 12 hours	RSD for mean relative response factors (RRF) calibrated by isotope dilution ≤ 20%; all other compounds ≤ 30%; initial calibration verification (ICV) ≤ 30% of true value	Inspect system, correct problem, rerun calibration and affected samples	Analyst	TA-11

QAPP Worksheet #24 (UFP-QAPP Manual Section 3.2.2) Analytical Instrument Calibration Table

HRGC/HRMS (PCB Congeners)	Retention time calibration, initial calibration, continuing calibration as required in SOP	Initial calibration after instrument set up, after major instrument changes and when continuing calibration criteria are not met. Calibration verification minimum every 12 hours	ICAL %RSD < 20% for target analytes calculated by isotope dilution. %RSD < 35% for target analytes calculated by internal standard. CCV < 30% Drift for Toxics and LOC congeners CCV 40-160% for non-Toxic congeners	Inspect system, correct problem, rerun calibration and affected samples	Analyst	AP-3
GC/FID (TPH)	Initial and continuing calibration as required in SOP	Initial calibration after instrument set up, after major instrument changes and when continuing calibration criteria are not met. Calibration verification every 10 samples	ICAL %RSD $\leq$ 20%; continuing calibration ± 15%	Inspect system, correct problem, rerun calibration and affected samples	Analyst	TA-1
HRGC/HRMS (PCDD/PCDFs)	Perfluorokerosene (PFK) Tune; initial and continuing calibration as required in SOP	Initial calibration after instrument set up, after major instrument changes and when continuing calibration criteria are not met. Continuing calibration minimum every 12 hours	%RSD for mean response of unlabeled standards $\leq$ 20%; labeled reference compounds ± 35%; Continuing calibration per SOP Table 6	Inspect system, correct problem, rerun calibration and affected samples	Analyst	AP-1
ICP (Metals/SEM Metals except mercury)	Initial and continuing calibration per SOP	Profile instrument; copper/ manganese (Cu/Mn) ratio daily; blank, RL and high standard daily; interference check sample (ICS) at start and every 8 hours; CCB, CCV every 10 samples	Cu/Mn ratio within 20% of value at time interelement corrections (IECs) determined. ICV, CCV ± 10% of true value; CCB Target Analytes<QL; ICSAB ± 20% of true value	Inspect system, correct problem, rerun calibration and affected samples	Analyst	C-5

QAPP Worksheet #24 (UFP-QAPP Manual Section 3.2.2) Analytical Instrument Calibration Table

ICP/MS (Metals)	Initial and continuing calibration per SOP	Intensity check, Cu/Mn ratio; blank, RL and high standard daily; ICS at start and every 8 hours; CCB, CCV every 10 samples	Cu/Mn ratio within 20% of value at time IECs determined. ICV, CCV ± 10% of true value; CCB Target Analytes<QL; ICSAB ± 20% of true value	Inspect system, correct problem, rerun calibration and affected samples	Analyst	C-6
CVAFS (Mercury)	Initial and continuing calibration per SOP	Calibrate daily with a minimum of 5 standards, 4 bubbler blanks, and ICV daily. CCV every 10 samples	Mean result of bubbler blanks <25 pg and %RSD<10, no single bubbler blank>50 pg ICV 80 -120% CCV 77-123% (total mercury)	Inspect system, correct problem, rerun calibration and affected samples	Analyst	BR-1
Mercury Analyzer (Atomic Absorption Spectrometer - SEM Mercury)	Initial and continuing calibration per SOP	Calibrate daily with a minimum of 5 standards and ICV daily. CCB, CCV every 10 samples	ICV/CCV 90-110%; CCB Mercury<QL	Inspect system, correct problem, rerun calibration and affected samples	Analyst	C-19
GC/FPD (Butyltins)	Initial and continuing calibration per SOP	External calibration prior to each use; continuing calibration every 10 injections or every 12 hours whichever is more frequent	ICV, CCV ± 25% of true value	Inspect system, correct problem, rerun calibration and affected samples	Analyst	C-2
UV-VIS (Sulfides, AVS)	Initial and continuing calibration per SOP	Allow spectrophotometer to warm up for 30 minutes. External calibration prior to each use; r ≥ 0.995; CCB, CCV every 10 samples	ICV, CCV ± 10% of true value; CCB Sulfide<QL	Inspect system, correct problem, rerun calibration and affected samples	Analyst	C-11

QAPP Worksheet #24 (UFP-QAPP Manual Section 3.2.2) Analytical Instrument Calibration Table

Rapid Flow Analyzer Colorimeter (Ammonia)	Initial and continuing calibration per SOP	Determine Linear Calibration range at initial calibration and verify at least every 6 months using a blank and 3 standards; r ≥ 0.995; CCB, CCV every 10 samples	Linearity check must be within ± 10% of original values; ICV, CCV ± 10% of true value; CCB Ammonia<QL	Inspect system, correct problem, rerun calibration and affected samples	Analyst	C-17
Rapid Flow Analyzer Colorimeter (Cyanide)	Initial and continuing calibration per SOP	Determine Linear Calibration range at initial calibration and verify at least every 6 months using a blank and 3 standards; r ≥ 0.995; CCB, CCV every 10 samples	Linearity check must be within ± 10% of original values; ICV, CCV ± 10% of true value; CCB Cyanide<QL	Inspect system, correct problem, rerun calibration and affected samples	Analyst	C-10
Ion Selective Electrode (TKN)	Initial and continuing calibration per SOP	Calibrate daily, ICV, CCV every 10 samples	ICV, CCV ± 10% of true value	Inspect system, correct problem, rerun calibration and affected samples	Analyst	C-16
UV-VIS (Phosphorus)	Initial and continuing calibration per SOP	External calibration prior to each use; r ≥ 0.995; CCB, CCV every 10 samples	ICV, CCV ± 10% of true value; CCB Phosphorous<QL	Inspect system, correct problem, rerun calibration and affected samples	Analyst	C-18
Induction Furnace (TOC)	Initial and continuing calibration per SOP	CCV each batch	CCV+/- 20% true value.	Inspect system, correct problem, rerun calibration and affected samples	Analyst	C-13
Analytical Balance (Grain Size, Percent Moisture)	Daily	Weigh and record NIST traceable standard weight in range of interest	± 5% of certified weight	Inspect system, correct problem, rerun calibration and affected samples	Analyst	AP-2, BR-2, C-14, TA-2, TA-9, TA-12, GT-1

[a]Refer to the Analytical SOP References table (Worksheet #23). All SOPs are contained in Appendix B.

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	CA	Responsible Person	SOP Reference[a]
GC/MS (SVOC)	Clean sources and quadrupole rods; maintain vacuum pumps	Tuning	Instrument performance and sensitivity	Service vacuum pumps twice per year; other maintenance as needed	See SOP	See SOP	Analyst or Section Supervisor	TA-4
HRGC/LRMS-SIM (PAH)	Clean sources and quadrupole rods; maintain vacuum pumps	Tuning	Instrument performance and sensitivity	Service vacuum pumps once per year; other maintenance as needed	See SOP	See SOP	Analyst or Section Supervisor	TA-8
HRGC/HRMS (Pesticides)	Clean sources and quadrupole rods; maintain vacuum pumps	Tuning	Instrument performance and sensitivity	Service vacuum pumps twice per year; other maintenance as needed	See SOP	See SOP	Analyst or Section Supervisor	TA-11
HRGC/HRMS (PCB Congeners)	Clean sources; maintain vacuum pumps	Tuning	Instrument performance and sensitivity	Service vacuum pumps once per year; other maintenance as needed	See SOP	See SOP	Analyst or Section Supervisor	AP-3
GC/FID (TPH)	Change septa, clean injectors, change or trim columns, install new liners	Detector signals and chromatogram Review	Instrument performance and sensitivity	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	TA-1
HRGC/HRMS (PCDD/PCDFs)	Clean sources and quadrupole rods; maintain vacuum pumps	Tuning	Instrument performance and sensitivity	Service vacuum pumps twice per year; other maintenance as needed	See SOP	See SOP	Analyst or Section Supervisor	AP-1
ICP (Metals, SEM Metals except mercury)	Replace disposables, flush lines	Cu/Mn ratio	Check connections	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	C-5
ICP/MS (Metals)	Replace disposables, flush lines	Cu/Mn ratio	Check connections	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	C-6

QAPP Worksheet #25 (UFP-QAPP Manual Section 3.2.2) Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

CVAFS (Low-Level Mercury)	Replace disposables, flush lines	Sensitivity check	Check connections	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	BR-1
Mercury Analyzer (Atomic Absorption Spectrometer - SEM Mercury)	Replace disposables, flush lines	Sensitivity check	Confirm that sample uptake and drain tubes are placed directly on the pump and secure	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	C-19
GC/FPD (Butyltins)	Change septa, clean injectors, change or trim columns, install new liners	Detector signals and chromatogram Review	Instrument performance and sensitivity	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	C-2
UV-VIS (Sulfides, AVS)	UV-VIS	Analytical standards	Instrument performance and sensitivity	Verify lamp is working	Daily or as needed	See SOP	Analyst or Section Supervisor	C-15
Rapid Flow Analyzer Colorimeter (Ammonia)	Replace disposables, flush lines	Analytical standards	Check connections	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	C-17
Rapid Flow Analyzer (Cyanide)	Replace disposables, flush lines	Analytical standards	Check connections	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	C-10
Ion Selective Electrode (TKN)	Replace membrane and filling solution; store electrode in ammonia solution	Verify standardization with solutions as required in SOP	Inspect membrane for signs of failure	Prior to use	See SOP	See SOP	Analyst or Section Supervisor	C-16

QAPP Worksheet #25 (UFP-QAPP Manual Section 3.2.2) Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

UV-VIS (Phosphorus)	UV-VIS	Analytical standards	Instrument performance and sensitivity	Verify lamp is working	Daily or as needed	See SOP	Analyst or Section Supervisor	C-18
Induction Furnace (TOC)	Replace disposables, clean quartz boat		Check connections	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	C-13
Analytical Balance (Grain Size, Percent Moisture)	Clean balance after each use; service annually	NIST Traceable weights	Check for cleanliness	Prior to every use	Measured weight within certified tolerance	Clean, verify zero on balance, reweigh; call for service	Analyst or Section Supervisor	AP-2, BR-2, C-14, TA-2, TA-9, TA-12, GT-1

[a] Refer to the Analytical SOP References table (Worksheet #23). All SOPs are contained in Appendix B.

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): AECOM Field Team (see Worksheet #21 for a list of the sample collection methods)
Sample Packaging (Personnel/Organization): AECOM Field Team
Coordination of Shipment (Personnel/Organization): AECOM Field Team
Type of Shipment/Carrier: UPS or FedEx for overnight delivery or laboratory courier
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Assigned laboratory personnel (see Worksheet #30 for laboratories providing analytical services)
Sample Custody and Storage (Personnel/Organization): Assigned laboratory personnel (see Worksheet #30 for laboratories providing analytical services)
Sample Preparation (Personnel/Organization): Assigned laboratory personnel (see Worksheet #30 for laboratories providing analytical services)
Sample Determinative Analysis (Personnel/Organization): Assigned laboratory personnel (see Worksheet #30 for laboratories providing analytical services)
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): Samples will not be stored in the field but will be shipped to the designated laboratory the same day as collection or no later than the day after collection. If circumstances require that the samples be stored in the field, they will be maintained under the method-specified conditions (e.g., kept at 4 ± 2° C) and shipped to the laboratory with sufficient time to meet holding times.
Sample Extract/Digestate Storage (No. of days from extraction/digestion): Sample extraction and digestion holding times are summarized in Worksheet #19.
SAMPLE DISPOSAL
Personnel/Organization: Assigned laboratory personnel (see Worksheet #30 for laboratories providing analytical services).
Number of Days from Analysis: Varies by laboratory; laboratory is required to give AECOM 30 days notice prior to intent to discard any project samples.

Sample Handling and Custody

Sample custody procedures ensure the timely, correct, and complete analysis of each sample for all parameters requested. A sample is considered to be in someone's custody if it:

- Is in his/her possession
- Is in his/her view, after being in his/her possession

QAPP Worksheet #26 (UFP-QAPP Manual Appendix A) Sample Handling System

- Is in his/her possession and has been placed in a secured location
- Is in a designated secure area

Sample custody documentation provides a written record of sample collection and analysis. The sample custody procedures require the specific identification of samples associated with an exact location and the recording of pertinent information associated with the sample, including time of collection and any preservation techniques, and a chain-of-custody (COC) record which serves as physical evidence of sample custody. Custody procedures will be similar to the procedures outlined in USACE's *Requirements for the Preparation of Sampling and Analysis Plans* (USACE 2001) and the USEPA's *Contract Laboratory Program Guidance for Field Samplers* (USEPA 2007b). The COC documentation system provides the means to individually identify, track, and monitor each sample from the time of collection through final data reporting. Sample custody procedures are developed for three areas: sample collection, laboratory analysis, and final evidence files, which are described in Worksheet #27 and SOP LPR-G-05.

Field Sample Handling and Custody

Field records provide a means of recording information for each field activity performed at the site. COC procedures document pertinent sampling data and all transfers of custody until the samples reach the analytical laboratory. The sample packaging and shipment procedures summarized in Worksheet #27 are designed to ensure that the samples arrive at the laboratory with the COC intact. Specific preservation procedures required for each analytical method are described in Worksheet #19.

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory): The field sample custody procedures including sample packing, shipment, and delivery requirements, are discussed in Worksheet #26. Sample management information is also provided in SOPs LPR-G-05 and LPR-G-06.

Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal): Each laboratory has a sample custodian who accepts custody of the samples and verifies that the information on the sample labels matches the information on the COC. The sample custodian will document any discrepancies, document sample condition upon receipt at the laboratory and will sign and date all appropriate receiving documents. Additional information on laboratory sample receiving procedures is provided in the text below this summary table.

Sample Identification Procedures: Each sample will be assigned a unique sample identification number using the Lower Passaic River Data Management System. This identification nomenclature will consist of an alphanumeric code that identifies the program, sample location (including depth interval if needed), and sample type. Details of sample identification are provided below.

Chain-of-Custody Procedures: A chain-of-custody will accompany all samples from the time of sampling through all custody transfers. Samples of the COC form and the Grab/Core Field Custody and Transfer Form are provided in LPR-G-05; the COC procedures are summarized below and in SOP LPR-G-05 provided in Appendix A.

Sample Identification

Samples will be uniquely identified at the time of collection. The sample ID will include the following alpha (A) or numeric (N) characters:

- NNA – Event (the year and the event within that year). It is anticipated that the LRC SSP2 will be the second LPR event in 2013. Therefore, “13B” will identify the LRC SSP2 Characterization event. However, if the schedule changes, the event code will be modified as appropriate.
- NNNN – Location (location number preceded by a “0”).
- A – Sample: C (core), G (grab), T (trip blank), P (PE sample).
- N – Sequential number representing sample number. Note that each core or grab is assigned a unique number upon retrieval, regardless of its acceptability.
- A – Depth. This character represents the relative depth interval, with "A" being most surficial, and "B", "C", "D", etc. being assigned with increasing depth. "X" is used if there is no associated depth (see below for example).
- A – Sample type: S (field sample), T (field duplicate), R (equipment rinsate blank).

For example,

13B-0523-C1BT is the field duplicate for the first core, second depth interval, for Station 523.

13B-0501-C1XR is the equipment rinsate blank on core liner associated with the first core at Station 501.

QAPP Worksheet #27 (UFP-QAPP Manual Section 3.3.3) Sample Custody Requirements

13B-0510-G2AR is the equipment rinsate blank associated with the second grab at Station 510.

Note that although equipment rinsate blanks are assigned an ID related to a sample recently processed or collected, this is for identification purposes only. Equipment rinsate blanks are collected weekly and are considered reflective of decontamination procedures for the week. They are therefore applicable to all samples collected that week using a particular type of equipment.

Chain of Custody Procedure

The COC form serves as an official communication to the laboratory detailing the specific analyses required for each sample. The COC record is prepared by the field sample custodian and accompanies samples from the time of sampling through all transfers of custody. The COC will be retained by the laboratory which analyzes and archives the samples. Three copies of the COC are created; one copy is retained in the field and two copies are sent to the laboratory.

Transfer of Custody and Shipment

Sample custody must be maintained from the time of sampling through shipment and receipt at the laboratory. The procedures for custody transfer are outlined in SOP LPR-G-05 (included in Appendix A).

QAPP Worksheet #27 (UFP-QAPP Manual Section 3.3.3) Sample Custody Requirements

Sample Packaging and Shipping Requirements

Sample custody must be maintained through shipment of samples to the contracted laboratory. All samples will be packaged and shipped at the end of each day unless other arrangements have been made with the laboratory. Samples will be delivered directly to the laboratory by sampling personnel or will be shipped using the procedures outlined in SOP LPR-G-6 (Appendix A).

Laboratory Custody Procedures

Each contracted laboratory will have a SOP that details the procedures used to document sample receipt and custody within the laboratory. The following procedures must be addressed in the laboratory custody SOP:

- Each laboratory must have a designated sample custodian who accepts custody of the samples at the time of delivery to the laboratory and verifies that the information on the sample labels matches the information on the COC. The sample custodian must sign and date all appropriate receiving documents and note any discrepancies in sample documentation as well as the condition of the samples at the time of receipt.
- Once the samples have been accepted by the laboratory, checked, and logged in, they must be maintained in accordance with laboratory custody and security requirements as outlined in the laboratory QMP.
- To ensure traceability of samples during the analytical process the laboratory will assign a sample ID number based on procedures outlined in the laboratory QMP or laboratory SOP.
- The following procedures, at a minimum, must be documented by the laboratory:
    - Sample extraction /preparation
    - Sample analysis
    - Data reduction
    - Data reporting
- Laboratory personnel are responsible for sample custody until the samples are returned to the sample custodian.
- When sample analysis and QC procedures are completed any remaining sample must be stored in accordance with contractual terms. A

QAPP Worksheet #27 (UFP-QAPP Manual Section 3.3.3) Sample Custody Requirements

minimum of 30 days notice must be provided before disposal of any sample. Data sheets, custody documents and all other laboratory records must be retained in accordance with contractual agreements.

Final Evidence Files

Laboratory records including COCs and other sample receiving records, sample preparation and analysis records, and the final data package become part of the laboratory final evidence file and must be retained as required by the contractual agreement. A PDF copy of the data package and associated electronic deliverable must be provided to AECOM in accordance with the contractual agreement and will be retained by AECOM along with associated field records and other related correspondence.

Final evidence files as retained by AECOM will include, but not be limited to, correspondence (paper and e-mail), plans, contractual documents, maps and drawings, field data, calculations, assessment reports, laboratory deliverables, progress and data reports. This information will be maintained in a secure area according to the procedures outlined in the Lower Passaic River Restoration Project QMP (AECOM 2009).

Matrix	Sediment
Analytical Group	SVOCs
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	TA-3, TA-4
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	TestAmerica (Knoxville)
Number of Sample Locations	74

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB and Equipment Rinsate Blank	MB - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team per task	No Target Compounds>QL; no common lab contaminants >5xQL	If sufficient sample is available, reanalyze samples. Qualify data as needed. Report results if sample results >20x blank result or sample results not detected (ND).	Analyst/Section Supervisor	Accuracy/Bias-Contamination	No Target Compounds>QL; no common lab contaminants >5xQL
Surrogates	Every sample	See Laboratory % RCLs (Appendix B-2)	Check calculations and instrument performance; recalculate, reanalyze.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix B-2)
LCS	1/Batch (20 samples)	See Laboratory % RCLs (Appendix B-2)	If sufficient sample is available, reanalyze samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix B-2)
MS/MSD	1/Batch (20 samples)	See Laboratory % RCLs/ RPD Control Limits (Appendix B-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias-Precision	See Laboratory % Recovery/ RPD Control Limits (Appendix B-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL

Matrix	Sediment
Analytical Group	PAHs and Alkyl PAHs
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria

Analytical Method/ SOP Reference	TA-7, TA-8
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	TestAmerica (Knoxville)
Number of Sample Locations	74

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB and Equipment Rinsate Blank	MB - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team per task	No Target Compounds>QL	If sufficient sample is available, reanalyze samples. Qualify data as needed. Report results if sample results >20x blank result or sample results ND.	Analyst/Section Supervisor	Accuracy/Bias-Contamination	No Target Compounds>QL
Pre-extraction Internal Standards	Every sample	See Laboratory %RCLs (Appendix B-2)	Check calculations. Ensure that instrument performance is acceptable. If signal/noise (S/N) ratio is <10, re-prepare and reanalyze sample. If S/N ratio is >10, flag the data.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix B-2)
LCS	1/Batch (20 samples)	See Laboratory %RCLs (Appendix B-2)	If sufficient sample is available, reanalyze samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory %RCLs (Appendix B-2)
MS	1/Batch (20 samples)	See Laboratory %RCLs (Appendix B-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias-Precision	See Laboratory %RCLs (Appendix B-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Laboratory Duplicate	1/Batch (20 field samples)	See Laboratory RPD Control Limits (Appendix B-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Precision	See Laboratory RPD Control Limits (Appendix B-2)
PE	12[a]	Supplier Certified Limits	Provide feedback to lab/lab reviews data.	AECOM Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

[a] Laboratories performing analysis for PCDD/PCDFs, PCBs (Homologs and Congeners), PAHs, and Organochlorine Pesticides will analyze PE samples, which are not blind and have known concentrations, that will be inserted with sample shipments at a rate of 1 per 20 samples.

Matrix	Sediment
Analytical Group	Organochlorine Pesticides
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	TA-11
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	TestAmerica (West Sacramento)
Number of Sample Locations	74

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

MB and Equipment Rinsate Blank	MB - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team per task	No Target Compounds>QL	1) If a target analyte is detected above the QL or greater than one-third the regulatory compliance limit or a potentially interfering compound is found at or above the QL the data must be evaluated to determine if the batch must be re-extracted or qualified. 2) If insufficient sample is available, reanalyze extracts. 3) Qualify data as needed	Analyst/Section Supervisor	Accuracy/Bias-Contamination	No Target Compounds>QL
Instrument Blank	Once per 12 hours if MB is not run	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed	Analyst/Section Supervisor	Accuracy/Bias-Contamination	No Target Compounds>QL

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

OPR Sample (or LCS)	1/Batch (20 samples)	See Laboratory %RCLs (Appendix B-2)	1) Check calculations. 2) Reanalyze OPR or LCS. Repeated reanalysis is acceptable if the failure is attributed to instrument variability. 3) If repeated failures occur on consecutive OPRs or LCSs for the same analyte, the cause of the failure will be investigated and corrected before any re-extraction is performed. 4) If sufficient sample is available, re-extract and reanalyze samples. 5) If insufficient sample is available, reanalyze extracts. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix B-2)
Labeled Isotope Dilution Internal Standards	Spiked into every sample and QC sample	See Laboratory %RCLs (Appendix B-2)	Check all calculations for error; ensure that instrument performance is acceptable; recalculate the data and/or reanalyze the extract if either of the above checks reveals a problem. If (S/N)<10 for the quantitation ion, re-prepare and reanalyze the sample. If S/N>10, flag the data.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory %RCLs (Appendix B-2)

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

MS	1/Batch (20 samples)	See Laboratory % RCLs (Appendix B-2)	1) Review Internal Standards. 2) Narrate any outliers.	Analyst/Section Supervisor	Accuracy/Bias-	See Laboratory % RCLs (Appendix B-2)
Laboratory Duplicate	1/Batch (20 samples)	RPD ≤ 30%	Narrate any outliers.	Analyst/Section Supervisor	Precision	RPD ≤ 30%
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
PE	12[a]	Supplier Certified Limits	Provide feedback to lab/lab reviews data.	AECOM Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

[a] Laboratories performing analysis for PCDD/PCDFs, PCBs (Homologs and Congeners), PAHs, and Organochlorine Pesticides will analyze PE samples, which are not blind and have known concentrations, that will be inserted with sample shipments at a rate of 1 per 20 samples.

Matrix	Sediment
Analytical Group	PCBs – Congeners (HRGC/HRMS)
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	AP-3
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	SGS-Analytical Perspectives
Number of Sample Locations	74

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

MB and Equipment Rinsate Blank	MB - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team per task	No Target Compounds>1/10 concentration in associated samples	Assess impact on data; Re-extract or qualify data as necessary	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Compounds>1/10 concentration in associated samples
Instrument Blank	Once per 12 hours if MB is not run	No Target Compounds>1/10 concentration in associated samples	Assess impact on data; Re-extract or qualify data as necessary	Analyst/Section Supervisor	Accuracy/Bias-Contamination	No Target Compounds>1/10 concentration in associated samples
Batch Control Spike	1/Batch (20 samples)	Native compounds by isotope dilution %D vs ICAL ≤ 30%; Native compounds measured against an isotopic isomer vs. ICAL %D = 50%; Labeled standard %D vs ICAL ≤ 50%; Native Compound RPDs ≤ 20% for isotope dilution and ≤ 30% for isotopic isomer; Standard RPDs ≤ 50%	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	Native compounds by isotope dilution %D vs ICAL ≤ 30%; Native compounds measured against an isotopic isomer vs. ICAL %D = 50%; Labeled standard %D vs ICAL ≤ 50%; Native Compound RPDs ≤ 20% for isotope dilution and ≤ 30% for isotopic isomer; Standard RPDs ≤ 50%
Pre-extraction Internal Standards	Spiked into every sample and QC sample	Per EPA Method 1668B Table 6	Check all calculations for error; ensure that instrument performance is acceptable; Assess impact on data; Re-extract or qualify data as necessary.	Analyst/Section Supervisor	Accuracy/Bias	Per EPA Method 1668B Table 6

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

MS	1/Batch (20 samples)	50-150%R for isotope dilution analytes; 10-200% for isotopic isomer	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias-Precision	50-100%R for isotope dilution analytes; 10-200% for isotopic isomer
Laboratory Duplicate	1/Batch (20 samples)	RPD≤ 50% for isotope dilution analytes; RPD ≤ 100% for isotopic isomers	Assess impact on data; Re-extract or qualify data as necessary	Analyst/Section Supervisor	Precision	RPD≤ 50% for isotope dilution analytes; RPD ≤ 100% for isotopic isomer
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x EML	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 50% if both samples are >5x EML
PE	12[a]	Supplier Certified Limits	Provide feedback to lab/lab reviews data.	AECOM Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

[a] Laboratories performing analysis for PCDD/PCDFs, PCBs (Homologs and Congeners), PAHs, and Organochlorine Pesticides will analyze PE samples, which are not blind and have known concentrations, that will be inserted with sample shipments at a rate of 1 per 20 samples.

Matrix	Sediment
Analytical Group	TPH- Extractables (GC/FID)
Concentration Level	Low - High
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	TA-1
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	TestAmerica (Burlington)
Number of Sample Locations	74

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB and Equipment Rinsate Blank	MB - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team per task	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Compounds>QL
Surrogates	Every sample	65-130%R	Check calculations and instrument performance; recalculate, reanalyze.	Analyst/Section Supervisor	Accuracy/Bias	65-130%R
LCS	1/Batch (20 samples)	65-125%R	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	65-125%R
MS/MSD	1/Batch (20 samples)	65-125%R; RPD ≤30%	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias-Precision	65-125%R; RPD ≤30%
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL

Matrix	Sediment
Analytical Group	PCDD/PCDFs (Isotope Dilution Mass Spectrometry)
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	AP-1
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	SGS-Analytical Perspectives (Wilmington, NC)
Number of Sample Locations	74

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	MB - 1/Batch (20 samples);	a)No Target Compound >25% of adjusted QL b)If detected, the concentration should be less than the RL or <10 times the highest concentration found in the sample batch; c) signal to noise should be >10:1 for isotopically labeled standard added before extraction; d) EDL ≤ 50% of the adjusted QL	Reanalyze affected samples. A B qualifier is applied to any specific analyte detected in the MB at a concentration above the RL, or the level detected in the blank that is statistically significant relative to that found in the associated sample. An invalid MB requires re-extraction and reanalysis of the samples.	Analyst/Section Supervisor	Accuracy/Bias-Contamination	a)No Target Compound >25% of adjusted QL b)If detected, the concentration should be less than the RL or <10 times the highest concentration found in the sample batch; c) signal to noise should be >10:1 for isotopically labeled standard added before extraction; d) EDL ≤ 50% of the adjusted QL
MB (con't.)		e)recoveries of the isotopically labeled standard should be 40% minimum or meet the requirements of c and d above				e)recoveries of the isotopically labeled standard should be 40% minimum or meet the requirements of c and d above
Equipment Rinsate Blank	1 per week per sampling team per task	No Target Compounds >QL	Re-assess equipment decontamination and storage procedures. Qualify data as needed.	AECOM FTM/AECOM Data Validators	Accuracy/Bias-Contamination	No Target Compounds > QL

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Labeled Compounds	1/Batch (20 samples)	EDL<DQL, with the exception of 2,3,7,8-TCDD	Reanalyze affected samples if EDL exceeds DQL limit criteria. Qualify data as needed.	Analyst/Section Supervisor	Sensitivity	EDL<DQL, with the exception of 2,3,7,8-TCDD
QC Standard	1/Batch (20 samples)	Within statistical control limits	Identify source of variance and assess impact on data reliability. Consider re-extraction and reanalysis of samples if necessary for generating reliable data and sufficient sample is available.	Technical Director	Accuracy/Bias	Within statistical control limits
Batch Control Spike	1/Batch (<20 samples)	Native Compound %D (vs. ICAL) ≤ 20%; Labeled Standard %D (vs. ICAL) ≤ 30%; Native Compound RPDs ≤ 10%; Labeled Standard RPDs ≤ 20%	Identify source of variance and assess impact on data reliability. Consider re-extraction and reanalysis of samples if necessary for generating reliable data and sufficient sample is available	Technical Director	Accuracy/Bias	Native Compound %D (vs. ICAL) ≤20%; Labeled Standard %D (vs. ICAL) ≤30%; Native Compound RPDs ≤10%; Labeled Standard RPDs ≤20%
MS	1/20 field samples	75-125%R	Assess impact on data; Re-extract or qualify data as necessary	Technical Director	Accuracy/Bias	75-125%R

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Laboratory Duplicate	1/Batch (20 samples)	RPD<25%	Identify source of variance and assess impact on data reliability. Consider re-extraction and reanalysis of samples if necessary for generating reliable data and sufficient sample is available	Technical Director	Laboratory Precision	RPD<25%
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
PE Sample	12[a]	Supplier Certified Limits	Provide feedback to lab/lab reviews data.	AECOM Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

[a] Laboratories performing analysis for PCDD/PCDFs, PCBs (Homologs and Congeners), PAHs, and Organochlorine Pesticides will analyze PE samples, which are not blind and have known concentrations, that will be inserted with sample shipments at a rate of 1 per 20 samples.

Matrix	Sediment
Analytical Group	Metals: ICP/AES 6010B
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	C-4, C-5
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	ALS (Kelso)
Number of Sample Locations	74

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

MB and Equipment Rinsate Blank	MB - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team per task	No Target Analytes>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section	Accuracy/Bias Contamination	No Target Analytes>QL
LCS or QC Standard	1/Batch (20 samples)	See Laboratory %RCLs (Appendix B-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section	Accuracy/Bias	See Laboratory %RCLs (Appendix B-2)
Laboratory Duplicates	1/Batch (20 samples)	RPD ≤30%	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD ≤30%
MS	1/Batch (20 samples)	See Laboratory %RCLs (Appendix B-2)	Flag Data. Discuss in narrative.	Analyst/Section	Accuracy/Bias	See Laboratory %RCLs (Appendix B-2)
Field Duplicate	1/20 field samples	RPD ≤ 35% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 35% if both samples are >5x QL

Matrix	Sediment
Analytical Group	Metals: ICP/MS
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	C-4, C-6
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	ALS (Kelso)
Number of Sample Locations	74

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB and Equipment Rinsate Blank	MB - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team per task	No Target Analytes>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section	Accuracy/Bias Contamination	No Target Analytes>QL
LCS or QC Standard	1/Batch (20 samples)	See Laboratory % RCLs (Appendix B-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section	Accuracy/Bias	See Laboratory % RCLs (Appendix B-2)
Laboratory Duplicates	1/Batch (20 samples)	RPD ≤20%	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD ≤20%
MS	1/Batch (20 samples)	See Laboratory % RCLs (Appendix B-2)	Flag Data. Discuss in narrative.	Analyst/Section	Accuracy/Bias	See Laboratory % RCLs (Appendix B-2)
Field Duplicate	1/20 field samples	RPD ≤ 35% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 35% if both samples are >5x QL

Matrix	Sediment
Analytical Group	Low Level Mercury
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	BR-1
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	Brooks Rand, LLC

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Number of Sample Locations 74

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	1/Batch (20 samples)	Average MB <2x MDL and standard deviation <0.67x MDL or <0.1x the concentration of project samples	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Contamination	Average MB < 2x MDL and standard deviation < 0.67x MDL or < 0.1x the concentration of project samples
Equipment Rinsate Blank	1 per week per sampling team	No Target Analytes>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section	Contamination	No Target Analytes>QL
CRM	1/Batch (20 samples)	Supplier Certified Limits	Reanalyze affected samples. Qualify data as needed.	Analyst/Section	Accuracy/Bias	Supplier Certified Limits
Laboratory Duplicates	1/Batch (10 samples)	RPD ≤30% or ± 2x the QL if result is ≤ 5x QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD ≤30% or ± 2x the QL if result is ≤ 5x QL
MS/MSD	1/Batch (10 samples)	70-130% R; ≤ 30% RPD	Flag Data. Discuss in narrative.	Analyst/Section	Accuracy/Bias-Precision	70-130% R; ≤30 RPD
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Butyltins
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	C-1, C-2
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	ALS (Kelso)
Number of Sample Locations	74

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB and Equipment Rinsate Blank	MB - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team per task	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Compounds>QL
LCS	1/Batch (20 samples)	See Laboratory % RCLs (Appendix B-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix B-2)
MS/MSD	1/Batch (20 samples)	See Laboratory % RCLs/RPD Control Limits (Appendix B-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias-Precision	See Laboratory % RCLs/RPD Control Limits (Appendix B-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	General Chemistry - Sulfides
Concentration Level	Low – High
Sampling SOP	LPR-S-01
Analytical Method/ SOP Reference	C-11
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	ALS (Kelso)
Number of Sample Locations	74

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB and Equipment Rinsate Blank	MB - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team per task	No Target Analyte>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Analyte>QL
LCS	1/Batch (20 samples)	55-130%R (see Appendix B-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	55-130%R (see Appendix B-2)
Laboratory Duplicates	1/Batch (20 samples)	RPD ≤ 20% (see Appendix B-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD ≤ 20% (see Appendix B-2)
MS	1/Batch (20 samples)	45-150%R (see Appendix B-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias	45-150%R (see Appendix B-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	General Chemistry – AVS/SEM
Concentration Level	Low
Sampling SOP	LPR-S-01
Analytical Method/ SOP Reference	C-15, C-5, C-19
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	ALS (Kelso)
Number of Sample Locations	74

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	MB - 1/Batch (20 samples)	No Target Analytes>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Analytes>QL
LCS	1/Batch (20 samples)	60-115%R for sulfide; See Laboratory % RCLs for metals (Appendix B-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	60-115%R for sulfide; See Laboratory % RCLs for metals (Appendix B-2)
Laboratory Duplicates	1/Batch (20 samples)	RPD ≤20% for sulfide; RPD ≤30% for metals	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD ≤20% for sulfide; RPD ≤30% for metals
MS	1/Batch (20 samples)	56-142%R for sulfide; See Laboratory % RCLs for metals (Appendix B-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias	56-142%R for sulfide; See Laboratory % RCLs for metals (Appendix B-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	General Chemistry – Ammonia -N
Concentration Level	Low
Sampling SOP	LPR-S-01
Analytical Method/ SOP Reference	C-17
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	ALS (Kelso)
Number of Sample Locations	74

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB and Equipment Rinsate Blank	MB - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Analyte>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Analyte>QL
LCS	1/Batch (20 samples)	90-110%R (see Appendix B-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	90-110%R (see Appendix B-2)
Laboratory Duplicates	1/Batch (20 samples)	RPD ≤20% (see Appendix B-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD ≤20% (see Appendix B-2)
MS	1/Batch (20 samples)	55-135%R (see Appendix B-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias	55-135%R (see Appendix B-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	General Chemistry - Cyanide
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	C-10
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	ALS (Kelso)
Number of Sample Locations	74

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB and Equipment Rinsate Blank	MB - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team per task	No Target Analyte>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Analyte>QL
LCS	1/Batch (20 samples)	78-110%R (see Appendix B-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	78-110%R (see Appendix B-2)
Laboratory Duplicates	1/Batch (20 samples)	RPD ≤20% (see Appendix B-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD ≤20% (see Appendix B-2)
MS	1/Batch (20 samples)	10-165%R (see Appendix B-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias	10-165%R (see Appendix B-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	General Chemistry - TKN
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	C-16
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	ALS (Kelso)
Number of Sample Locations	74

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB and Equipment Rinsate Blank	MB - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team per task	No Target Analyte>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Analyte>QL
LCS	1/Batch (20 samples)	75-130%R (see Appendix B-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	75-130%R (see Appendix B-2)
Laboratory Duplicates	1/Batch (20 samples)	RPD ≤20% (see Appendix B-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD ≤20% (see Appendix B-2)
MS	1/Batch (20 samples)	23-174%R (see Appendix B-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias	23-174%R (see Appendix B-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	General Chemistry - Phosphorus
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	C-18
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	ALS (Kelso)
Number of Sample Locations	74

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB and Equipment Rinsate Blank	MB - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team per task	No Target Analyte>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Analyte>QL
LCS	1/Batch (20 samples)	85-115%R (see Appendix B-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	85-115%R (see Appendix B-2)
Laboratory Duplicates	1/Batch (20 samples)	RPD ≤20% (see Appendix B-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD ≤20% (see Appendix B-2)
MS	1/Batch (20 samples)	75-125%R (see Appendix B-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias	75-125%R (see Appendix B-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	General Chemistry – TOC
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	C-13
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	ALS (Kelso)
Number of Sample Locations	74

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB and Equipment Rinsate Blank	MB - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team per task	No Target Analyte>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Analyte>QL
LCS	1/Batch (20 samples)	74-118%R (see Appendix B-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	74-118%R (see Appendix B-2)
Laboratory Duplicates	1/Batch (20 samples)	RPD ≤20% (see Appendix B-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD ≤20% (see Appendix B-2)
MS	1/Batch (20 samples)	69-123%R (see Appendix B-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias	69-123%R (see Appendix B-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Physical Testing – Grain Size Analysis
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	GT-2
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	GeoTesting Express, Inc., Acton, MA
Number of Sample Locations	74

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	N/A	N/A	N/A	N/A	N/A	N/A
LCS	N/A	N/A	N/A	N/A	N/A	N/A
Laboratory Duplicates	1 Per batch of 20 samples	RPD ≤ 20%	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD ≤ 20%
Field Duplicate	1/20 field samples	RPD ≤ 50%	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 50%

N/A – Not applicable to this analysis.

Matrix	Sediment
Analytical Group	Physical Testing – Specific Gravity
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	GT-3
Sampler's Name	AECOM Field Staff

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Field Sampling Organization AECOM
Analytical Organization GeoTesting Express, Inc. Acton, MA
Number of Sample Locations 74

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	N/A	N/A	N/A	N/A	N/A	N/A
LCS	N/A	N/A	N/A	N/A	N/A	N/A
Laboratory Duplicates	1 Per batch of 20 samples	RPD ≤ 20%	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD ≤ 20%
Field Duplicate	1/20 field samples	RPD ≤ 50%	Evaluate during data validation. Qualify data.	AECOM Data Validators	Precision	RPD ≤ 50%

N/A – Not applicable to this analysis.

Sample Collection Documents and Records	On-site Analysis Documents and Records	Off-site Analysis Documents and Records	Data Assessment Documents and Records	Other
Field notes, field data sheets, field logbooks, photographic records	Field notes, field data sheets, field logbooks, photographic records	Custody records and copies of airbills	Reports of field sampling audits	Progress reports
Custody records and airbills	Field instrument calibration records	Analytical data packages and EDDs	Reports of laboratory audits	Draft Site Characterization Report - Prepared and submitted to clients and USEPA.
Communication logs, records or copies of pertinent e-mails	Field measurement data	Communication logs	Validation reports	
QAPP and HASP	QAPP and HASP	Laboratory notebooks and bench sheets documenting sample preparation and analysis	QA reports to management	
Correction action reports and results	Correction action reports and results	Instrument maintenance and calibration records, standard preparation and traceability records	CA reports and results	
Documentation of field modifications	Documentation of field modifications	Laboratory SOPs and documentation of method modifications	Internal laboratory assessments, including internal audits, third-party audit reports, and PE results	
Daily Activity Log	Daily Activity Log	CA logs and documentation of corrective action results	Results of PE samples	

QAPP Worksheet #29 (UFP-QAPP Manual Section 3.5.1) Project Documents and Records Table

This section describes the project data management process tracing the data from their generation through final use and/or storage. All project data, communications, and other information must be documented in a format useable to project personnel.

Project Document Control System

Project documents are controlled by AECOM's Project Document Control Manager who will maintain and manage hardcopies and electronic copies of all project related documents according to the Lower Passaic River QMP (AECOM 2009). Electronic copies of all information relating to this project are maintained on the project network files which are backed up at least once per day; access to these files is limited to authorized project personnel. All project data and information must be documented in a standard format which is usable by all project personnel.

Data Recording

Data generated during this project will be captured electronically or entered by hand into bound field or laboratory logbooks or preprinted forms (refer to SOP LPR-G-01 in Appendix A). Computer generated laboratory data will be managed using the laboratory information management system (LIMS); the LIMS used by subcontracted laboratories are described in their QA documentation.

Data Quality Assurance Procedures

AECOM will monitor the progress of sample collection to verify that samples are collected as planned. The progress of sample collection and processing will be monitored through the documentation of samples collected and shipped each day. The participating laboratories must maintain a formal QMP to which they adhere and which addresses all data generating aspects of daily operations. A policy of continuous improvement will allow all data generation processes to be reviewed and modified as needed to meet project objectives. Periodic audits of field and laboratory operations will ensure that data collection, documentation and QC procedures are being followed.

Laboratory Data Transmittal

Laboratory data are managed by the laboratory's LIMS beginning with the sample receiving process. Laboratories are required to provide validated data reports (sample results, QC summary information, and supporting raw data) including EDDs within the turnaround times specified in Worksheet #30. EDDs will be provided in an Earthsoft EQuIS® four-file format (modified by AECOM), using reference file tables provided by AECOM. All EDDs will be checked prior to transmittal to AECOM using current versions of Earthsoft's Electronic Data Processor (EDP).

QAPP Worksheet #29 (UFP-QAPP Manual Section 3.5.1) Project Documents and Records Table

Data Storage and Retrieval

Completed forms, logbooks, photographs, data packages, and electronic files will be transmitted regularly to the Project Document Control Manager. Each laboratory will maintain copies of all documents it generates as well as backup files of all electronic data relating to the analysis of samples. Raw data and electronic files of all field samples, QC analyses and blanks must be archived from the date of generation and maintained by each laboratory in accordance with the terms of the contract between AECOM and the laboratory. Project closeout will be conducted in accordance with contractual guidance. As required by the Settlement Agreement all data and other project records will be made available to USEPA.

Data transfer to USEPA will include a Multi-media Electronic Data Deliverable (MEDD) that conforms to the 2007 EPA Region 2 MEDD format. The MEDD will include all qualified and rejected data (including the reported, numerical value for rejected data).

Matrix	Analytical Group	Concentration Level	Sample Locations/ ID Number	Analytical SOP	Data Package Turnaround Time[a]	Laboratory/ Organization	Backup Laboratory/ Organization
Sediment	SVOCs	Low	All	TA-4	30 days	Test America 5815 Middlebrook Pike Knoxville, TN 37921 John Reynolds 865.291.3000	ALS 1317 South 13th Ave. Kelso, WA 98626 Lynda Huckestein 360.577.7222
Sediment	PAHs/alkyl PAHs	Low	All	TA-8	35-56 days	Test America 5815 Middlebrook Pike Knoxville, TN 37921 John Reynolds 865.291.3000	ALS 1317 South 13th Ave. Kelso, WA 98626 Lynda Huckestein 360.577.7222
Sediment	Organochlorine Pesticides	Low	All	TA-11	45-60 days	Test America 880 Riverside Parkway West Sacramento, CA 95605 Robert Weidenfeld 865.291.3000	None Identified
Sediment	PCBs (Homologs and Congeners)	Low	All	AP-3	45-60 days[c]	SGS-Analytical Perspectives 2714 Exchange Dr. Wilmington, NC 28405 Heather Distel 910.794.1613	Test America 5815 Middlebrook Pike Knoxville, TN 37921 John Reynolds 865.291.3000
Sediment	TPH – Extractables	Low	All	TA-1	30 days	Test America 30 Community Drive, Suite 11 South Burlington, VT 05403 Kris Dusablon 865.291.3000	Test America 777 New Durham Road, Edison, NJ 08817 Jamie Capaci 732.549.3900
Sediment	PCDD/PCDFs	Low	All	AP-1	30 days[c]	SGS - Analytical Perspectives 2714 Exchange Dr. Wilmington, NC 28405 Heather Distel 910.794.1613	Test America 5815 Middlebrook Pike Knoxville, TN 37921 John Reynolds 865.291.3000

QAPP Worksheet #30 (UFP-QAPP Manual Section 3.5.2.3) Analytical Services Table

Sediment	Metals	Low	All	C-5, C-6	30 days	ALS 1317 South 13th Ave. Kelso, WA 98626 Lynda Huckestein 360.577.7222	Brooks Rand, LLC 3958 6th Ave. NW Seattle, WA 98107 Lydia Greaves 206-632-6206
Sediment	Low Level Mercury	Low - High	All	BR-1	30 days	Brooks Rand, LLC 3958 6th Ave. NW Seattle, WA 98107 Lydia Greaves 206.632.6206	ALS 1317 South 13th Ave. Kelso, WA 98626 Lynda Huckestein 360.577.7222
Sediment	Butyltins	Low	All	C-2	30 days	ALS 1317 South 13th Ave. Kelso, WA 98626 Lynda Huckestein 360.577.7222	TestAmerica 30 Community Drive, Suite 11 South Burlington, VT 05403 Kris Dusablon 865.291.3000
Sediment	AVS/SEM	Low	All[b]	C-15, C-5, C-19	30 days	ALS 1317 South 13th Ave. Kelso, WA 98626 Lynda Huckestein 360.577.7222	Test America 301 Alpha Drive RIDC Park Pittsburgh, PA 15238 Chris Kovitch 412.963.7058
Sediment	Ammonia-N	Low	All[b]	C-17	30 days	ALS 1317 South 13th Ave. Kelso, WA 98626 Lynda Huckestein 360.577.7222	Test America 4101 Shuffel St. NW North Canton, OH 44720 John Reynolds 865.291.3000

QAPP Worksheet #30 (UFP-QAPP Manual Section 3.5.2.3) Analytical Services Table

Sediment	Cyanide	Low	All	C-10	30 days	ALS 1317 South 13th Ave. Kelso, WA 98626 Lynda Huckestein 360.577.7222	Test America 4101 Shuffel St. NW North Canton, OH 44720 John Reynolds 865.291.3000
Sediment	TKN	Low	All[b]	C-16	30 days	ALS 1317 South 13th Ave. Kelso, WA 98626 Lynda Huckestein 360.577.7222	Test America 4101 Shuffel Dr. NW North Canton, OH 44720 John Reynolds 865.291.3000
Sediment	Total Phosphorus	Low	All[b]	C-18	30 days	ALS 1317 South 13th Ave. Kelso, WA 98626 Lynda Huckestein 360.577.7222	Test America 4101 Shuffel Dr. NW North Canton, OH 44720 John Reynolds 865.291.3000
Sediment	TOC	Low	All	C-13	30 days	ALS 1317 South 13th Ave. Kelso, WA 98626 Lynda Huckestein 360.577.7222	Test America 301 Alpha Drive RIDC Park Pittsburgh, PA 15238 Chris Kovitch 412.963.7058
Sediment	Total Sulfide	Low	All[b]	C-11	30 days	ALS 1317 South 13th Ave. Kelso, WA 98626 Lynda Huckestein 360.577.7222	Test America 301 Alpha Drive Pittsburgh, PA 15238 Chris Kovitch 412.963.7058

QAPP Worksheet #30 (UFP-QAPP Manual Section 3.5.2.3) Analytical Services Table

Sediment	Grain Size	N/A	All	GT-2	30 days	GeoTesting Express, Inc. 125 Nagog Park Acton, MA 01720 Gary Torosian 978.893.1229	PTS Laboratories 8100 Secura Way Santa Fe Springs, CA 90670 Michael Mark Brady 562.347.2502
Sediment	Specific Gravity	N/A	All	GT-3	30 days	GeoTesting Express, Inc. 125 Nagog Park Acton, MA 01720 Gary Torosian 978.893.1229	PTS Laboratories 8100 Secura Way Santa Fe Springs, CA Michael Mark Brady 562.347.2502

[a] Turnaround time is in calendar days from receipt of the last sample in the data package sample delivery group.
[b] 0.0 to 0.5 foot interval, grab sample only
[c] Select samples may be submitted for 14 day turnaround time

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing CA	Person(s) Responsible for Monitoring Effectiveness of CA
Safety Audit	Once, during the first week of field work	Internal	AECOM	AECOM Health and Safety Director	AECOM FTM, SSO, and Task Manager	AECOM FTM, SSO and Task Manager	AECOM Health and Safety Director
Technical Audit of Field Activities	Once during the first few days of field operations; follow-up audits as necessary	Internal	AECOM	AECOM Project QA Manager	AECOM, FTM and Task Manager	AECOM, FTM and Task Manager	AECOM Project QA Manager
Internal Lab Audits	Per laboratory QA Manual; at least annually	Internal	Laboratory	Laboratory QA Officer or designee	Laboratory management and staff	Laboratory management and staff	Laboratory QA Officer
External Lab Audits	Audit will be performed at least annually.	External	State or national certifying authority.	State or national certifying authority auditor.	Laboratory management and staff	Laboratory management and staff	Laboratory management and staff; AECOM Project QA Manager or designee.
Project-Specific Laboratory Readiness Review	Audit will be performed in advance of field work or during the initial stages.	External	AECOM	AECOM Project QA Manager, Project Chemist, or designee	Laboratory management and staff	Laboratory management and staff	Laboratory management and staff.
PE samples	PE samples will be sent to selected laboratories for analysis in advance of initiation of field work, contingent upon schedule (see Worksheet #32).[a]	External	AECOM	AECOM Project QA Manager, Project Chemist, or designee	Laboratory management and staff	Laboratory management and staff	Laboratory management and staff; AECOM Project QA Manager or designee.

QAPP Worksheet #31 (UFP-QAPP Manual Section 4.1.1) Planned Project Assessments Table

[a] Laboratories performing analysis for PCDD/PCDFs, PCBs (Homologs and Congeners), PAHs, and Organochlorine Pesticides will analyze PE samples, which are not blind and have known concentrations, that will be submitted with sample shipments at a rate of 1 per 20 field samples. See Worksheet #20 for more details.

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Timeframe of Notification	Nature of CA Response Documentation	Individual(s) Receiving CA Response	Timeframe for Response
Field System Audit	Written audit report	AECOM PM, AECOM Task Manager, AECOM FTM, CPG QA Coordinator	Verbal summary of major findings within 24 hours; written report within one week.	Memo with possible re-audit	AECOM Project QA Manager, AECOM PM, AECOM Task Manager, CPG QA Coordinator, USEPA RPM, USACE PM	One week
Internal Laboratory Audits	Written audit report	Laboratory Manager	Major deficiencies within 24 hours; written report as required by laboratory QA Manual	Memo or as required by laboratory QA Manual	Laboratory Manager, Laboratory PM AECOM Project Chemist, AECOM Project QA Manager, AECOM Task Manager, CPG QA Coordinator, USEPA RPM, USACE PM (if project DQOs are affected)	As required by laboratory QA Manual
External Laboratory Audits by third-party entities	Written audit report	Laboratory Manager	Major deficiencies communicated orally at exit meeting; written report based on policy of external auditing organization	Letter or as required by external auditing organization with possible re-audit	External auditing organization AECOM Project Chemist, AECOM Project QA Manager, AECOM Task Manager, CPG QA Coordinator, USEPA RPM, USACE PM (if project DQOs are affected)	As required by external auditing organization

QAPP Worksheet #32 (UFP-QAPP Manual Section 4.1.2) Assessment Findings and Response Actions

PE samples*	Written PE results evaluation report	Laboratory Manager	Deficiencies (results outside acceptance range) identified within one week of receiving laboratory results	Request for laboratory investigation into deficiencies and corrective action, if necessary, before project field samples are analyzed. Corrective action may include investigation and preparation by the laboratory of a corrective action report, analysis of a new PE sample, or if AECOM deems appropriate, the analyses may be moved to another lab.	AECOM Project Chemist, Project QA Manager, and CPG QA Coordinator	One week
*Contingent upon schedule. Refer to the discussion below.						

Non-Conformance/QC Reporting

A non-conformance is defined as an identified or suspected deficiency in, or deviation from, procedures described in an approved document (e.g., improper sampling procedures, improper instrument calibration, errors in calculations or errors in computer algorithms); an item where the quality of the end product itself or subsequent activities conducted using the document or item would be affected by the deficiency; or an activity that is not conducted in accordance with established plans or procedures. Any project staff member that discovers or suspects a non-conformance is responsible for initiating a non-conformance report to the Project QA Manager. The Project QA Manager will evaluate each non-conformance report and provide a response describing the actions to be taken and assigning responsibility for the corrective action. The Task Manager will verify that the nonconforming item or procedure is not used until the corrective action has been performed and found to produce acceptable results. If the non-conformance involves instrumentation or equipment, the device must be tagged to indicate it is defective and not to be used.

A copy of each non-conformance report will be added to the project file. Original non-conformance reports will be maintained by the Project QA Manager.

QAPP Worksheet #32 (UFP-QAPP Manual Section 4.1.2) Assessment Findings and Response Actions

Assessment

Assessment activities will measure the effectiveness of the project implementation and associated QA/QC activities. Audits are used as a means of monitoring the performance of field and laboratory activities and are conducted by the Project QA Manager or another member of the QA staff. Audits will include systems audits which are more qualitative in nature and will be made at appropriate intervals to ensure that all aspects of the QA program are operative. Performance audits are quantitative audits which are conducted to assess the accuracy of measurement systems; this would include the use of PE samples.

Systems audits will be conducted for field and laboratory operations to assess implementation of QA/QC requirements and determine if the systems under review are capable of meeting project DQOs. Any minor deficiencies noted during an audit will be corrected as soon as possible according to an agreed upon schedule. If a major deficiency is noted during an audit a stop work order will be issued until the deficiency can be corrected and the effectiveness of the corrective action measured and documented. A stop work order may be issued by the Project QA Manager who will notify the AECOM Task Manager and the AECOM PM. The conditions which lead to a stop work order must be documented in sufficient detail to clearly define the problem and identify possible corrective measures. All communications among project staff which address evaluation of the problem and appropriate solutions must be attached to the stop work order. The Project QA Manager, the AECOM Task Manager, and AECOM PM must agree in writing to resume work after review of the data supporting correction of the deficiency. The Project QA Manager will maintain a corrective action log which lists deficiencies that were noted, the individual(s) responsible for follow-up, documentation of the effectiveness of the corrective actions taken, and implementation of procedures to prevent recurrence of the problem.

A written report will be prepared for all audits regardless of the outcome and submitted to the AECOM Task Manager, AECOM PM, CPG QA Coordinator, USEPA RPM, and USACE PM. Any modifications to the existing program, corrective actions required, or the need for additional audits will be documented.

In addition to participation in any audits conducted by AECOM QA personnel, participating laboratories are required to take part in regularly scheduled performance evaluations and audits required by state and federal agencies as part of ongoing certification or participation in specific contracts and to provide copies of the results of these PE samples and audits to the Project Chemist. Any change in laboratory ownership, management, or certification status must be immediately reported to the Project Chemist. If any laboratory analysis is found to be out of control, the laboratory must immediately implement corrective action and notify the Project Chemist. The laboratory PM will be responsible for documenting the effectiveness of the corrective action measures before continuing analysis of project samples.

QAPP Worksheet #32 (UFP-QAPP Manual Section 4.1.2) Assessment Findings and Response Actions

In addition to evaluation of PE data performed by the laboratories as part of their routine participation in USEPA Water Supply (WS) and Water Pollution (WP) certification programs, laboratories performing analysis for PCDD/PCDFs, PCBs (Homologs and Congeners), PAHs, and Organochlorine Pesticides will analyze known PE samples, which are not blind, that will be submitted with sample shipments at a rate of one per 20 field samples. Since the LRC SSP2 program will occur more than six months from the completion of the last sediment analytical sampling program, a formal pre-program PE study will be completed for PCDD/PCDFs, PCBs (Homologs and Congeners), PAHs, and Organochlorine Pesticides prior to the start of field activities. A PE study will also be conducted if there is a change in laboratories. The results of this pre-program PE study are included in Appendix D.

Type of Report	Frequency	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipient(s)
Progress Reports	Monthly	Due the 15th of each month	AECOM PM / CPG Project Coordinator	USEPA RPM
Audit Reports	Per Audit Schedule in Worksheet #31	Within one month of completion of audit.	AECOM Project QA Manager	AECOM Task Manager, AECOM PM, CPG QA Coordinator, USEPA RPM, USACE PM
Data Validation Reports	After laboratory data are received and validated	See Worksheet #16	AECOM Data Validation Task Manager	AECOM Project QA Manager, Task Manager, and AECOM PM
Nonconformance report	As needed	When a nonconformance is identified	AECOM staff	AECOM Project QA Manager, AECOM Task Manager, USEPA RPM
Corrective Action Reports	When corrective action is required	When corrective action is implemented	AECOM Project QA Manager or designated Task Manager	AECOM PM, AECOM Task Manager, and Project Team Members, CPG QA Coordinator, CPG Project Coordinator, USEPA RPM

The monthly management report will address the results of any corrective actions or audits which took place during the reporting period as well as any trends noted during the data validation process. Problems or issues which arise between regular reporting periods may be identified to management at any time. Information included in the monthly progress report will include:

- Results of audits conducted during the reporting period;
- Discussion of problems with measurement data including issues related to precision, accuracy, completeness, representativeness, and comparability that could affect achievement of the DQOs; and
- A listing of any non-conformance reports or stop-work orders, the associated corrective actions taken, and the outcome of these corrective actions.

Verification Input	Description	Internal/ External	Responsible for Verification)
Field data	Field data will be reviewed for completeness, accuracy and agreement with SOP LPR-G-01 (Field Records).	Internal	AECOM FTM or designee
Chain-of-Custody	The COC will be reviewed initially in the field for complete and correct information.	Internal	AECOM FTM or designee
	Upon receipt at the laboratory the COC will be compared to sample containers and any discrepancies will be resolved.	External	Laboratory Sample Custodian
	During validation the COC will be verified against laboratory receipt and reporting information.	External	AECOM Data Validator
Laboratory Data Packages and EDD	Laboratory data (hard copy and EDDs) will be verified by the laboratory performing the work for completeness and technical accuracy prior to release.	Internal	Laboratory
	Laboratory data will be assessed using the validation procedures described in Worksheets #35 and #36	External	AECOM Data Validator
Audit Reports	Audit reports will be reviewed to confirm that specified corrective actions have been taken, the corrective action has been effective and all documentation of corrective action is attached to the audit report.	Internal	AECOM Project QA Manager
Assessment actions and reports	QA/QC process will be reviewed for agreement with QAPP	External	ddms, Inc.

Step IIa/IIb	Validation Input	Description	Responsible for Validation
IIa	Field SOPs, field records	Verify conformance to approved sampling and field measurement procedures; ensure that activities met performance criteria; and verify that deviations from procedures or criteria were documented.	Debra Simmons, Project QA Manager/AECOM
IIa	Analytical data deliverables, contractual documents	Verify the required deliverables, analyte lists, method holding times, analytical procedures, laboratory qualifiers, measurement criteria, project QLs, and analyses of PE samples conform to specifications. Verify that deviations from procedures or criteria were documented.	Lisa Krowitz, Validation Coordinator/AECOM
IIa	Field records, database output	Verify transcription of field data from field forms to database.	Jim Herberich, Data Management Task Manager/AECOM
IIa	Custody records, analytical data reports	Review traceability from sample collection through reporting.	Lisa Krowitz, Validation Coordinator/AECOM
IIa	Laboratory EDDs, analytical data reports, database output	Verify EDDs against hard-copy analytical reports.	Jim Herberich, Data Management Task Manager/AECOM
IIa	Data validation reports, database output	Verify that entry of qualifiers was correct and complete.	Lisa Krowitz, Validation Coordinator/AECOM
IIb	Analytical data reports	Verify that reported analytes, holding times, analytical procedures, measurement criteria, and project QLs conform to the QAPP. Verify that deviations from procedures or criteria were documented.	Lisa Krowitz, Validation Coordinator/AECOM
IIb	Analytical data reports, validation guidance	One hundred percent of the data will be validated (see details below)	Lisa Krowitz, Validation Coordinator/AECOM
IIb	QAPP, analytical data reports, validation guidance	Verify that the qualifiers applied during validation were in conformance with the QAPP and specified validation guidance.	Lisa Krowitz, Validation Coordinator/AECOM
IIb	Analytical data reports	Verify that PE samples were analyzed at the frequency specified in the QAPP and met the acceptance criteria.	Lisa Krowitz, Validation Coordinator/AECOM
IIb	QAPP, data validation reports	Verify that data validation was performed in accordance with the QAPP specifications and that all required peer reviews were conducted. If validation actions deviated from the QAPP specifications and/or regional validation guidance based on professional judgment, verify that rationale was documented.	Debra Simmons, Project QA Manager/AECOM

QAPP Worksheet #35 (UFP-QAPP Manual Section 5.2.2) Sampling and Analysis Validation (Steps IIa and IIb) Process Table

Data Validation

Validation of each analytical group will be limited to the target analytes listed in Worksheet #15 for that group. At a minimum, 100% full validation (includes review of raw data and spot check for verification of calculations) will be conducted for PCDDs/PCDFs (the 2, 3, 7, 8-substituted Congeners and Homologs listed in Worksheet #15), and all 209 PCB Congeners and Homologs for each sample delivery group (SDG). For all other parameters, 100% full validation (as appropriate to the analyses) will be performed on the first two SDGs. The remaining SDGs will be subject to full validation at a twenty percent frequency and limited validation for the remaining SDGs.

Limited validation will be based on information provided by the laboratory on their QC forms, and will include no or minimal raw data review. At a minimum, limited validation will include the following data elements:

- Agreement of analyses conducted with COC requests
- Holding times and sample preservation
- Initial and continuing calibrations and analytical sequence
- Mass spectrometer tuning (GC/MS only)
- Internal standard performance (GC/MS only)
- Laboratory blanks/equipment blanks
- Surrogate recoveries
- Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) results
- MS/MSD results
- Laboratory duplicate results
- Field duplicate results
- ICS results (AB solution only)
- ICP serial dilution results

QAPP Worksheet #35 (UFP-QAPP Manual Section 5.2.2) Sampling and Analysis Validation (Steps IIa and IIb) Process Table

- Percent solids
- QLs and sample results (limited to evaluating dilutions and re-analyses)

If significant issues (e.g., those affecting achievement of the DQOs) are noted during full validation, the limited validation will be expanded to include this issue. Systematic or random errors that would not be detected during a review of the summary forms might include, for example, misidentification or quantitation of compounds, transcription errors, or calculation errors. In addition, limited validation will provide review of key laboratory QC elements, which would highlight potential underlying lab issues which may require further investigation (i.e., full validation effort). If a high frequency of measurement performance issues is found, the issue will be investigated and an additional validation effort may be implemented. AECOM plans to maintain communication/notification systems with the laboratory during the analytical process to circumvent significant QC issues. If QC issues do arise, investigations and corrective actions will be documented and implemented in a timely fashion to optimize the amount of un-qualified data.

In addition, data packages receiving limited validation will receive a completeness check so that full validation could be performed at a later data, if necessary. The check will verify that the raw data for each sample (including all re-analyses and dilutions) are present and complete. The data supporting the sample results, such as QC samples (MBs, LCS, MS/MSD), calibrations, tunes, and preparation logs, will also be reviewed for overall completeness, however, an in-depth inventory to ensure specific association with all sample data will not be performed.

No additional completeness check will be performed for the geotechnical tests due to limited back-up information provided and the nature of the tests.

Validation qualifiers will be applied based on the criteria in the QAPP, method-specific Region II validation SOPs, or professional judgment. These will be limited to “J”, “UJ”, “NJ”, and R, as defined in the Region II validation SOPs. PCDDs/PCDFs, PAHs by HRGC/LRMS-SIM, PCB congeners, and pesticides by HRGC/HRMS reported as EMPCs due to ion ration, signal-to-noise, ratio, or peak retention issues will be qualified as EMPC-J. Reports summarizing data qualification as a result of the validation effort will be prepared.

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria*	Data Validator (title and organizational affiliation)
IIa	Sediment	Metals	Low	Region II validation SOP HW-2; QAPP Worksheets #12, #15, #19, #24, and #28	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIa	Sediment	Butyltins	Low	QAPP Worksheets #12, #15, #19, #24, and #28.	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIa	Sediment	PCDD/PCDFs	Low	Region II validation SOP HW-25; QAPP Worksheets #12, #15, #19, #24, and #28	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIa	Sediment	Low Level Mercury	Low	QAPP Worksheets #12, #15, #19, #24, and #28 and EPA 1631	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIa	Sediment	Organochlorine Pesticides	Low	QAPP Worksheets #12, #15, #19, #24, and #28 and EPA 1699.	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIa	Sediment	PCBs – homologs and congeners	Low- High	Region II validation SOP HW-46; QAPP Worksheets #12, #15, #19, #24, and #28	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIa	Sediment	SVOCs	Low	Region II validation SOP HW-22; QAPP Worksheets #12, #15, #19, #24, and #28	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIa	Sediment	PAHs and Alkyl PAHs	Low	QAPP Worksheets #12, #15, #19, #24, and #28 and NOAA 130	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIa	Sediment	TPH Extractables	Low	QAPP Worksheets #12, #15, #19, #24, and #28, New Jersey OQA-QAM-025, Test America SOP No. BR-GC-009, Rev 1, 9/10/2008	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIa	Sediment	Wet chemistry	Low	QAPP Worksheets #12, #15, #19, #24, and #28	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIa	Sediment	Physical Testing	N/A	QAPP Worksheets #12, #15, #19, #24, and #28	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIb	Sediment	Metals	Low	Region II validation SOP HW-2, and/or QAPP Worksheets #12, #15, #19, #24, and #28, whichever is more stringent	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIb	Sediment	Butyltins	Low	QAPP Worksheets #12, #15, #19, #24, and #28; data will be qualified using Region II SOP HW-44 as guidance	Lisa Krowitz, Validation Coordinator/AECOM (or designate)

QAPP Worksheet #36 (UFP-QAPP Manual Section 5.2.2) Sampling and Analysis Validation (Steps IIa and IIb) Summary Table

IIb	Sediment	PCDDs/PCDFs	Low	Region II validation SOP HW-25 and/or QAPP Worksheets #12, #15, #19, #24, and #28, whichever is more stringent	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIb	Sediment	Low Level Mercury	Low	Worksheets #12, #15, #19, #24, and #28 and EPA 1631; data will be qualified using Region II SOP HW-2 as guidance	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIb	Sediment	Organochlorine Pesticides	Low	QAPP Worksheets #12, #15, #19, #24, and #28 and EPA 1699; data will be qualified using Region II SOP HW-25 as guidance	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIb	Sediment	PCBs – homologs and congeners	Low- High	Region II validation SOP HW-46; QAPP Worksheets #12, #15, #19, #24, and #28	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIb	Sediment	SVOCs	Low	Region II validation SOP HW-22 and/or QAPP Worksheets #12, #15, #19, #24, and #28, whichever is more stringent	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIb	Sediment	PAHs and Alkyl PAHs	Low	QAPP Worksheets #12, #15, #19, #24, and #28 and NOAA 130; data will be qualified using Region II SOP HW-22 as guidance	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIb	Sediment	TPH Extractables	Low	QAPP Worksheets #12, #15, #19, #24, and #28, New Jersey OQA-QAM-025, Test America SOP No. BR-GC-009, Rev 1, 9/10/2008; data will be qualified using Region II SOP HW-44 as guidance	Lisa Krowitz, Validation Coordinator/AECOM (or designate)
IIb	Sediment	Wet chemistry	Low	QAPP Worksheets #12, #15, #19, #24, and #28	Lisa Krowitz, Validation Coordinator/AECOM (or designate)

QAPP Worksheet #36 (UFP-QAPP Manual Section 5.2.2) Sampling and Analysis Validation (Steps IIa and IIb) Summary Table

IIb	Sediment	Physical Testing	N/A	QAPP Worksheets #12, #15, #19, #24, and #28	Lisa Krowitz, Validation Coordinator/AECOM (or designate)

*Validation criteria include professional judgment where appropriate and necessary. Note that the most relevant Region II data validation SOPs are used for validation guidance when there is no SOP for the specified method. In those cases, QAPP Worksheets #12, #15, #19, #24, and #28 and/or the analytical method and laboratory SOPs are used as reference and the most relevant Region II data validation SOPs (as identified above) are used for guidance in applying validation qualifiers.

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:
AECOM's data validation staff will validate all laboratory data in accordance with the protocols described in Worksheet #36. The Project QA Manager, in conjunction with the project team, will determine whether the analytical data meet the requirements for use in making decisions related to further actions at the site. The results of laboratory measurements will be compared to the DQOs described in Worksheet #11 of this document.

Describe the evaluative procedures used to assess overall measurement error associated with the project:
During the data validation process the validator will use information confirming sample identification; sample preparation; analysis within holding time; instrument calibration data; and results of QC samples designed to assess blank contamination, analytical precision, and accuracy to identify any limitations in data use and, if known, data bias. The validator will apply qualifiers as needed to reflect any limitations on the use of specific data points and prepare a report detailing the information reviewed, data limitations, and overall usability. Patterns of data use limitations or anomalies which become apparent during the validation process or as the users will be reviewed with the Project QA Manager and the appropriate laboratory. Data that do not meet the quality acceptance limits of Worksheet #28, or quality levels of Worksheet #15, or analytical performance criteria specified in Worksheet #12 will be clearly identified in the database so data users are aware of any limitations associated with data usability. Details of the problems identified during data validation and the bias in the data will be provided in the associated validation memorandum.

Identify the personnel responsible for performing the usability assessment:
Data validation will be performed by a third party data validator Labortory Data Consultants, Inc. (LDC) under the supervision of the AECOM Validation Coordinator. The usability assessment will be performed jointly by the AECOM and CPG project teams and will include input by field personnel, QA staff, and project management.

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:
The documentation generated during data validation will include a comprehensive memorandum that describes the information reviewed the results of this review and provides a recommendation on overall data usability and limitations on specific data points. The memorandum and associated validation worksheets provide information on the samples included in the review and the date they were collected; the condition of samples when received at the laboratory and any discrepancies noted during the receiving process; verification of sample preparation and analysis within the method specified holding time; instrument calibration information; review of associated QC analyses including blanks, LCS, MS, and field and/or laboratory duplicates; verification of selected reported values from raw data. As a result of this review standard qualifiers are entered into the database so that data users can readily identify any limitations associated with a specific data point.

Assessment of data usability will be performed by AECOM's data validation staff using current USEPA Region II data validation guidance. The results of the Data Usability Assessment will be summarized in the final project report. The following items will be assessed and conclusions drawn based on their results:

Holding Time: All sample data will be checked to verify that both sample preparation and analysis were performed within the method required holding time.

Calibration: Data associated with instrument calibration and verification of calibration will be reviewed to confirm that all data were generated using properly calibrated instrumentation.

QAPP Worksheet #37 (UFP-QAPP Manual Section 5.2.3) Data Usability Assessment

Accuracy/Bias Contamination: Results for all field blanks, trip blanks, laboratory MBs, and instrument calibration blanks will be checked against performance criteria specified in Worksheet #28; results for analytes that exceed criteria will be identified and the impact on field sample data will be assessed. Data will be summarized by type of blank.

Accuracy/Bias Overall: Reported values of LCS, performance samples, and MS will be evaluated against the spiked or certified concentration and the %R will be calculated and compared to the criteria specified in Worksheet #28. The %R information will be used to assess the bias associated with the analysis. Recovery for MS in conjunction with the recovery reported for performance samples and LCS will provide information on the impact of the sample matrix on specific analyses. Average recoveries will be calculated and reported by analyte for each type of QC sample.

Precision: Results of the RPD will be calculated for each analyte in laboratory and field duplicates. These RPDs will be checked against measurement performance criteria presented on Worksheet #28; RPDs exceeding the stated criteria will be identified. Additionally the combined RPD of each analyte will be averaged across duplicate pairs whose original and duplicate values are both greater than the QL and a combined overall RPD average will be determined for each analyte in both laboratory and field duplicates. This information will be used to draw conclusions about the precision of the analyses and, for field duplicates, the precision of sampling and analysis. Any limitations on the use of the data will also be described.

Sensitivity: During validation, RLs will be checked against expected achievable QLs presented on Worksheet #15. Sample-specific factors such as analytical dilutions, percent moisture, and sample volume will affect the achievable laboratory limits. All reported analytical results will be evaluated to determine if adequate sensitivity was achieved. As shown in Worksheet #15, the Project QL Goals are not expected to be achieved in all cases. The impact on data usability, limitations on the use of the data, and conclusions about the sensitivity of the analysis will be reported.

Representativeness: A review of field records will be used to confirm that sample collection and handling was performed in a manner that conformed to the designated SOP. Similarly laboratory preparation procedures will be reviewed during validation to ensure that a representative sample was selected for analysis. Any deviations or modifications to field or laboratory procedures which might impact the representativeness of the sample will be discussed in the project final report.

Comparability: The sampling and analytical procedures which will be used in this program have been selected to ensure that the resulting data will be comparable to data from similar programs conducted previously or which will be conducted in the future. Any modifications or deviations from stated procedures which might impact data comparability will be addressed in the project final report

Completeness: Completeness for the analytical program will be calculated as the number of data points that are accepted as usable based on the

QAPP Worksheet #37 (UFP-QAPP Manual Section 5.2.3) Data Usability Assessment

validation process divided by the total number of data points for each analysis. Completeness will be reported for each analytical category and an overall value will be reported. As shown in Worksheet #12, the analytical completeness goal is ≥90%. Completeness for the field program will be calculated as the number of samples successfully collected compared to the total number proposed in this QAPP. The completeness goal for the field sampling program is ≥95%.

Each of the PQOs presented on Worksheet #11 will be reviewed to determine if the stated objective was met. The major impacts observed from data validation, DQIs and measurement performance criteria assessments will be used to assess the overall data quality and whether PQOs were achieved. The final report will summarize the information used to reconcile each objective and overall conclusions regarding data quality.

Attachment 1

References

AECOM, 2008. *Lower Passaic River Restoration Project. Bathymetric Surveys. Quality Assurance Project Plan*. AECOM, Westford, MA. Revision 4 October 2008.

AECOM, 2009. *Quality Management Plan*, Lower Passaic River Restoration Project, CERCLA Docket No. 02-2007-2009. AECOM, Westford, MA, September 2009 or current version.

AECOM, 2010a. *Lower Passaic River Restoration Project Data Management Plan*. AECOM, Westford, MA. July 2010, including all revisions.

AECOM, 2010b. *Quality Assurance Project Plan/Field Sampling Plan Addendum. Remedial Investigation Water Column Monitoring/Physical Data Collection for the Lower Passaic River, Newark Bay and Wet Weather Monitoring*. Lower Passaic River Restoration Project. Revision 4. AECOM, Westford, MA. March 2010.

AECOM, 2011a. *Low Resolution Coring Characterization Summary. Lower Passaic River Study Area RI/FS.* Draft submitted February 2010 and resubmitted July 2011.

AECOM, 2011b. *Quality Assurance Project Plan. Lower Passaic River Study Area. River Mile 10.9 Characterization*. Revision 3. AECOM, Chelmsford, MA. September 2011.

AECOM, 2012. *Quality Assurance Project Plan. Lower Passaic River Restoration Project. Low Resolution Coring Supplemental Sampling Program.* Revision 3. AECOM, Chelmsford, MA. June 2012.

ASI. 2006. *Technical Report, Geophysical Survey, Lower Passaic River Restoration Project.* Prepared for NJDOT-OMR. ASI Project No. 25-068.

Battelle, 2005. *Lower Passaic River Restoration Project. Pathways Analysis Report*. Prepared for U.S. Environmental Protection Agency Region 2 and U.S. Army Corps of Engineers. Battelle, Duxbury, MA.

Chemical Land Holdings (CLH), 1995. Work Plan, Vol. 1 of *Passaic River Study Area Remedial Investigation Work Plans*. Chemical Land Holdings (now Tierra Solutions, Inc.), Newark, NJ. January 1995.

ENSR, 2008. *Lower Passaic River Restoration Project RI/FS. Quality Assurance Project Plan. RI Low Resolution Coring/Sediment Sampling*. Revision 4. ENSR, Westford, MA. October 2008.

Erickson, M.J., C.R. Barnes, M.R. Henderson, R. Romagnoli, and C.E. Firstenberg. 2007. *Geomorphology-Based Interpretation of Sedimentation Rates from Radiodating, Lower Passaic River, New Jersey*. Integrated Environmental Assessment and Management. Apr; 3(2):166-92.

Krone, C.A.; Brown, D.W.; Burrows, D.G.; Bogar, R.G.; Chan, S.; Varanasi, U.A., 1988. *Method for Analysis of Butyltin Species and Measurement of Butyltins in Sediment and English Sole Livers from Puget Sound*, Environmental Conservation Division, Northwest and Alaska Fisheries Center, National Marine Fisheries Service, NOAA, November, 1988.

Malcolm Pirnie, Inc. (MPI), 2004-2005. *LPRSA RI/FS Sampling Program*. www.ourpassaic.org (Last accessed January 20, 2008).

MPI 2005a. *Lower Passaic River Restoration Project. Work Plan*. Prepared for US Environmental Protection Agency and US Army Corps of Engineers. Malcolm Pirnie, Inc., White Plains, NY.

MPI 2005b. *Lower Passaic River Restoration Project. Revised preliminary Draft Field Sampling Plan.* Volume 3. Prepared for US Environmental Protection Agency and US Army Corps of Engineers. Malcolm Pirnie, Inc., White Plains, NY

MPI, 2005c. *Lower Passaic River Restoration Project. Quality Assurance Project Plan*. Prepared for US Environmental Protection Agency and US Army Corps of Engineers. Malcolm Pirnie, Inc., White Plains, NY. August 2005.

MPI, 2006a. *Lower Passaic River Restoration Project. Draft Field Sampling Plan*. Volume 1. Prepared for US Environmental Protection Agency, US Army Corps of Engineers, and New Jersey Department of Transportation/Office of Maritime Resources. Malcolm Pirnie, Inc., White Plains, NY; Earth Tech, Inc., Bloomfield, NJ; Battelle, Stony Brook, NY. January 2006.

MPI, et al., 2006b. *Lower Passaic River Restoration Project. Field Sampling Plan*. Volume 2. Prepared for US Environmental Protection Agency, US Army Corps of Engineers. Malcolm Pirnie, Inc., White Plains, NY.

MPI, Battelle, HydroQual, Inc, 2006. *Draft Geochemical Evaluation (Step 2), Lower Passaic River Restoration Project*. March 2006.

MPI, 2007a. *Draft Source Control Early Action Focused Feasibility Study. for Lower Passaic River Restoration Project*. Malcolm Pirnie, Inc., White Plains, NY. June 2007.

MPI, 2007b. *Lower Passaic River Restoration Project. Conceptual Site Model.* Prepared for US Environmental Protection Agency, US Army Corps of Engineers, and New Jersey Department of Transportation/Office of Maritime Resources. Malcolm Pirnie, Inc., White Plains, NY. February 2007.

MPI, 2007c. *QAPP/FSP Addendum for Lower Passaic River Restoration Project Empirical Mass Balance Evaluation*. Malcolm Pirnie, Inc., White Plains, NY. December 2007.

NOAA, 2010. Navigational Chart 12327, Edition 104. November 2010.

New Jersey Department of Environmental Protection (NJDEP), 2008. New Jersey Department of Environmental Protection Soil Remediation Standards (SRSs) for residential soil (http://www.state.nj.us/dep/srp/regs/rs//).

Sea Engineering Inc., and Hydroqual, Inc., 2011. *Lower Passaic River System Understanding of Sediment Transport*. May 2011.

Tierra Solutions, Inc., 1999. *Passaic River Study Area Ecological Sampling Plan. Quality Assurance Project Plan.* March 1999.

Tierra Solutions, Inc., 2004. *Newark Bay Study Area Remedial Investigation Work Plan. Sediment Sampling and Source Identification Program*. Newark Bay, New Jersey. Volume 1a of 3. Inventory and Overview Report of Historical Data. Text and Appendices. Revision 0. June 2004.

Tierra Solutions, Inc. 2010. *Combined Sewer Overflow/Stormwater Outfall Investigation Quality Assurance Project Plan. Lower Passaic River Study Area*. Revision 0. July 2010.

United Stated Army Corps of Engineers (USACE), 2001. *Requirements of Sampling and Analysis Plans.* EM-200-1-3. February 2001.

USEPA, 1980. Comprehensive Environmental Response, Compensation, and Liability Act, December, 1980.

United States Environmental Protection Agency (USEPA), 2005. *Intergovernmental Data Quality Task Force Uniform Federal Policy for Quality Assurance Project Plans Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs Part 1: UFP-QAPP Manual Publication Numbers: EPA: EPA-505-B-04-900A DOD: DTIC ADA 427785* Final Version 1 March 2005.

USEPA, 2007a. *Administrative Settlement Agreement and Order on Consent for Remedial Investigation/ Feasibility Study.* CERCL Docket No. 02-2007-2009. May 2007.

USEPA, 2007b. *Contract Laboratory Program Guidance for Field Samplers.* OSWER 9240.0-44. EPA 540-R-07-06. FINAL July 2007.

USEPA, 2008 "Final Update IV" to the Third Edition of the manual, *Test Methods for Evaluating Solid Waste Physical/Chemical Methods*, EPA publication SW-846, Office of Solid Waste, January 3, 2008 Available online: http://www.epa.gov/epawaste/hazard/testmethods/sw846/online/index.htm

USEPA, 2009. *Regional Screening Levels (Formerly PRGs). Screening Levels for Chemical Contaminants*. Updated December 2009. Available online: http://www.epa.gov/region9/superfund/prg/index.html/

USEPA, 2011. *USEPA Comments on Draft LRC Characterization Summary Report.* January 25, 2011.

Van den Berg, et al., 2006. *The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds*. Tox. Sci. 93(2):223-241.

Windward, 2009a. *Lower Passaic River Restoration Project. Lower Passaic River Study Area RI/FS. Quality Assurance Project Plan: Fish and decapod crustacean tissue collection for chemical analysis and fish community survey. Final.* Prepared for Cooperating Parties Group, Newark, NJ. Windward Environmental LLC, Seattle, WA

Windward, 2009b. *Lower Passaic River Restoration Project. Lower Passaic River Study Area RI/FS. Quality Assurance Project Plan: Surface sediment chemical analyses and benthic invertebrate toxicity and bioaccumulation testing. Final.* Prepared for Cooperating Parties Group, Newark, NJ. October 8, 2009. Windward Environmental LLC, Seattle, WA.

Windward and AECOM, 2009. *Lower Passaic River Study Area Human Health and Ecological Risk Assessment Streamlined 2009 Problem Formulation Document.* Prepared for Cooperating Parties Group, Newark, New Jersey. October 8, 2009. Windward Environmental LLC, Seattle, WA and AECOM, Westford, MA.

Appendix A

Field Standard Operating Procedures

Appendix B

Laboratory Standard Operating Procedures

Appendix C

Sediment Probing Survey

Appendix D

Pre-Program Performance Evaluation Sample Analyses and Evaluations